THE OHIO JOURNAL OF SCIENCE

Vol. 74 MARCH, 1974 No. 2

# A NATURAL HISTORY STUDY OF THE VASCULAR FLORA OF CEDAR BOG, CHAMPAIGN COUNTY, OHIO[1, 2]

CLARA MAY FREDERICK

*Division of Science-Mathematics, Urbana College, Urbana, Ohio 43078*

ABSTRACT

Cedar Bog Nature Preserve is a relict boreal bog situated in the Mad River valley in Champaign County, west-central Ohio. Originating following the retreat of the Wisconsin glacier, it has been maintained by the combination of a usually cool moist microclimate and a uniform flow of cool ground water. Microclimatic data recorded from 1963 through 1969 demonstrate that Cedar Bog has cooler temperatures and a shorter frost-free period than do adjoining areas. These two factors have resulted in the survival of plants unique to this part of Ohio.

Within the Bog area, six major plant associations have been identified—the bog meadow, marl meadow, arbor vitae, swamp forest, hardwood forest, and shrub associations. The marl meadow (the wettest area) lies in the northeast section, with the bog meadow and arbor vitae associations south of it, the swamp forest occurring adjacent to the arbor vitae, on the west and the hardwood forest lying beyond the swamp forest.

A total of 546 taxa of vascular plants was identified in the Bog; this list is presented, together with information on occurrence, abundance, and whether or not the species has been reported earlier. Of these taxa, 173 were previously unreported for Cedar Bog, whereas 21 with earlier documented occurrences are now apparently extinct in the Bog.

## INTRODUCTION

Cedar Bog Nature Preserve, under the supervision of the Ohio Historical Society, is located in sections 31 and 32, Urbana Township, Champaign County, Ohio, on the Saint Paris topographic quadrangle (fig. 1). The preserve lies both north and south of Woodburn Road and just west of the Erie and New York Central railroads.

The first name given to the area was the Dallas Arbor Vitae Bog. In 1941, the state of Ohio purchased approximately 98 acres and named the area Cedar Swamp Nature Sanctuary. In 1967, the name was officially changed to Cedar Bog Nature Preserve. In the same year, the area was designated a Natural Landmark by the United States Department of Interior. In 1969, The Nature Conservancy purchased an additional 100 acres adjacent to the original area. This vegetational study, however, is concerned primarily with the original 98 acres.

Cedar Bog is unique in Ohio, a northern arbor vitae bog in which are found plant species ordinarily native only to the bogs of northern Michigan. Some species in the Bog, however, are normally associated with the wet prairies of the central areas of the United States. Although Cedar Bog is indeed unique, no comprehensive study has previously been made of the vegetation of the area.

The objective of this study was to survey in detail the vascular flora of Cedar Bog. Essential to this study were (1) a review of the vegetational history of the

[1]This paper includes material from a thesis and a dissertation submitted to the Graduate School of The Ohio State University in partial fulfillment of the requirements for the Master of Science and Doctor of Philosophy degrees.

[2]Manuscript received November 6, 1970.

area, (2) a survey of the microclimatic factors which maintain the Bog, and (3) identification of the vegetational associations present in the Bog. The results of each are included in this report. Preparation of the list of vascular plants observed in the Bog during 1963–1970, the list making up the major part of this report, also permitted comparison of the present flora with that of earlier reports

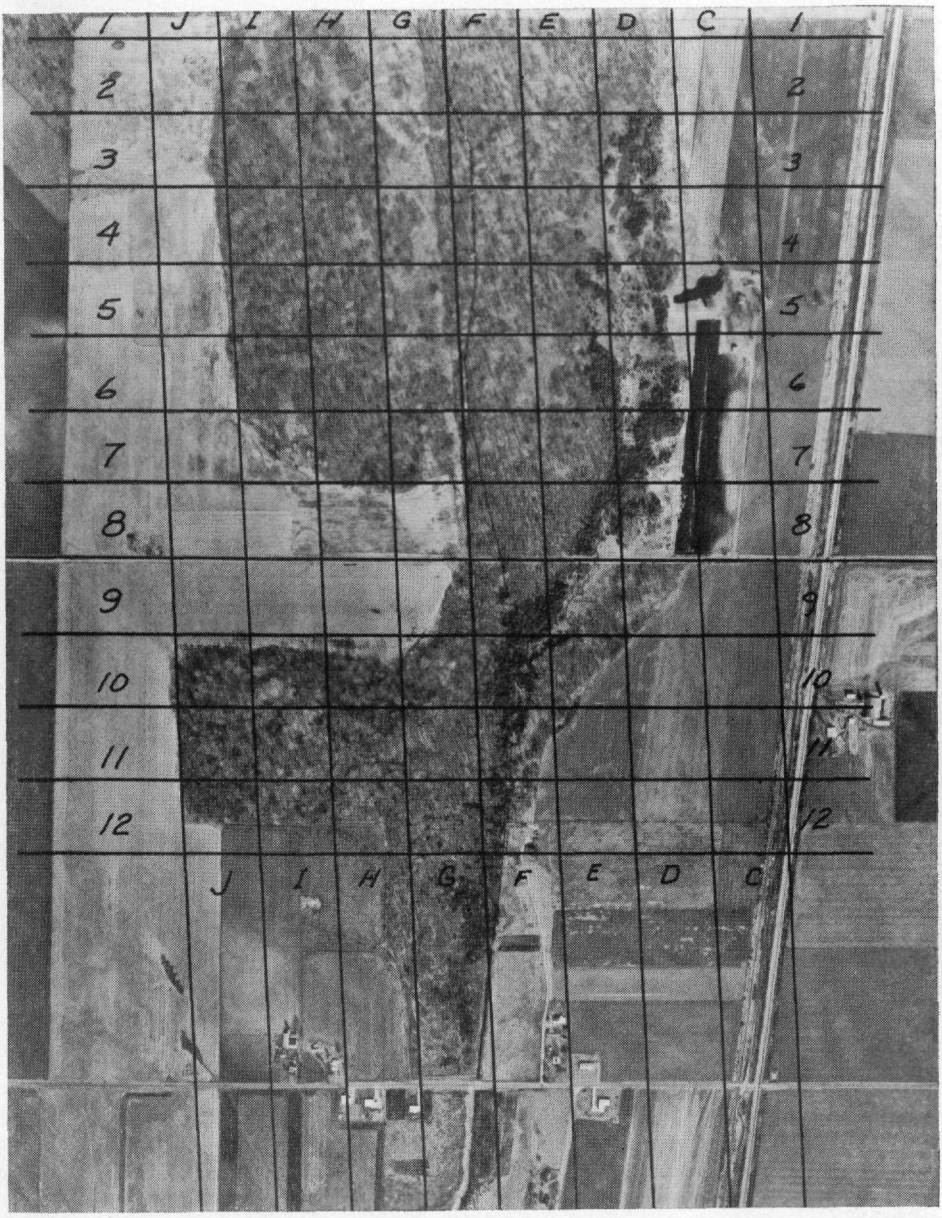


FIGURE 1. Aerial photograph of the entire Cedar Bog area, with location grid. North is up on the photo. Woodburn Road extends east-west through the middle of the picture, and Dallas Road extends east-west half a mile south, across the bottom of the picture. Cedar Run is the eastern stream approximately following vertical row D north of Woodburn Road, and the western unnamed stream, here called West Branch, similarly follows vertical row F.

(especially those of Kellerman and Werner, 1893, and Kellerman and Wilcox, 1895) and with the record of specimens taken from the Bog and preserved in The Ohio State University and Urbana College Herbaria. Voucher specimens from the present study have also been placed in these two herbaria.

In order to be able to refer readily to a site within the Bog, a location grid was devised (shown on figs, 1, 2, and 3) to define study quadrats. Locations in these quadrats, in this paper, are given by using the letter(s) and number(s) of the sites (for example, F–3, or B– and C–2, 3, and 4). These numbers also appear on the voucher-specimen labels, where the location symbols are preceded by "Q," designating "quadrat."

## VEGETATIONAL HISTORY

The initial history of the vegetation in Champaign County is recorded in the data of Goldthwait (1958 and 1959), Williams (1957), Kapp and Gooding (1964), and Ogden (1966). Just prior to the Wisconsin glaciation, the area must have resembled the forest regions of north-central Ontario today (Goldthwait, 1958; Ogden, 1966). The dominant trees were probably black spruce (*Picea mariana*), white spruce (*P. glauca*), hemlock (*Tsuga canadensis*), and possibly balsam fir (*Abies balsamea*). With the advance of the glacier, about 23,000 years ago, all vegetation was destroyed, but the glacier lasted only about 8–9,000 years here (Goldthwait, 1958).

The first plants, immediately following glaciation, were probably sedges and grasses, rapidly replaced by spruce, fir, balsam, and poplar (Ogden, 1966). In Medway Bog in Clark County, Williams (1957) found that northern coniferous forests were the dominant vegetation for a long period following deglaciation, but were gradually displaced by trees of the lake forest or hemlock-hardwood formations. These, in turn, were replaced by deciduous forest communities, particularly oak-hickory.

Finally, this area became predominantly grassland, indicating the warmer dryer conditions of the Xerothermic period. Prairie species probably became established in the area during this warmer period. Ogden's (1966) pollen studies in Silver Lake, about 20 miles north of Cedar Bog, indicated that, about 9,800 years ago, the boreal forest was generally replaced by oaks. Grassland vegetation later replaced the oaks during the Xerothermic period, which he dated at $3{,}600 \pm 212$ years ago.

Although these same changes apparently occurred in Champaign County, Cedar Bog remained cooler and wetter than the adjoining areas during this warmer period because many boreal species remain. No doubt Cedar Bog was then at the water-table level, as it is today, with a constant supply of cool ground water maintaining a reasonably cool microclimate, allowing relict boreal plants to persist in Cedar Bog since early postglacial times.

Wet prairies of the Mad River valley covered a vastly larger area than they do today, extending from Kings Creek to Springfield as late as the early 1800's (Dobbins, 1937). These wet "prairies" were comparable to the present bog meadow areas in Cedar Bog, with arbor vitae growing in or at the edges of the prairies as it does today.

Atwater (1838) described Ohio, when it was first settled, as "a great grassy country . . . along our rivers and in our prairies and barrens." He described, too, how in December 1814 good peat was found "from near to Springfield, Clark County, almost all the way to Dayton." Atwater also told of peat in a "wet prairie" east of Urbana, yet he made no mention of Cedar Bog. Perhaps even as late as 1814, these swampy areas were so wet that investigation of them was not possible. Atwater (1838) believed that many of the wet prairies were one "thick forests of white cedar" (arbor vitae) because of old logs "in different stages of decay" four feet below the surface.

Further examples of swamps and wet prairies were given by Roberts (*in* Antrim, 1872), who described the disappearance of one lake and its surrounding bog. Rushcreek Lake was connected to a swamp, as he called it, about 6 or 7 miles long and ¾ mile wide. Roberts reported, "I can . . . attest that all around the margin of the lake, as also in the bed of Rushcreek, so far as the swamp extends, a person attempting to wade would sink beneath the mire as quick as in the water. . . . The whole area has evidently once been a lake connecting Mad River and Rushcreek, the former running South, and the latter North." The lake, itself, ". . . is much smaller now . . . and scarce one hundredth part as large as it originally was. The swamp connected with it is much more firm now than forty years ago. . . . The tallest corn is now grown in some places where cattle would not then dare venture." Based on what is known of its history, a similar description probably could also have been written of the Cedar Bog region during the 1800's.

In Antrim's book (1872), several pioneers are reported as recalling their youth during the early settlement in and around Urbana. The plants that they mentioned are the same as those found today: beech, white oak, bur oak, hickory, honey locust, chestnut, ash, ironwood, dogwood, hawthorn, maple, poplar, and walnut, as well as wild grape, hazelnut, plum, and rose-of-sharon. This colorful description is given of the stream margins.

> The old settlers say that the margins of the streams, near which the first settlements were generally made, were thickly covered with a low, matted growth of small timber, while nearer to the water was a rank growth of long grass, interlaced with morning-glory and wild pea vines, among which funereal willows and clustering alders stood like sentinels on the outpost of civilization.

Although many lakes, swamps, and wet prairies long since gone are described (Antrim, 1872), no one mentioned the Cedar Bog area. But the bog area and the arbor vitae must have been present, for *Thuja* trees in the Bog today are that old or older. Again, perhaps the area was too wet and too dangerous to investigate. Or, because it was not suitable for farming, it may have been simply ignored.

The greatest changes in the Bog and adjoining areas were manmade and occurred in the 20th century. The area of the bog habitat was drastically reduced. Probably the one most significant operation reducing the bog area was the dredging and deepening of the Mad River. Dredging was first completed in 1912, and then had to be repeated in 1915 following the 1913 flood (Middleton, 1917). Much of the wet prairie in northern Clark County, south of Cedar Bog, was drained by diverting the mouth of Cedar Run a mile to the north. Evans (1944) cited the following newspaper item, but does not indicate the paper from which it was taken.

> Urbana, July 13 (1929). The death knell of the famous Cedar swamps and the 2,000 acres of other swamp land along Mad River near the junction of both Clark and Champaign Counties was sounded Thursday when the county commissioners, surveyors and land owners of both met and determined to abandon a mile of Cedar Creek, running the mouth into Mad River north of the county line bridge. With the dredging of this river will follow a further invasion of the swamps, which are eventually to be eliminated throughout the valley. The bridge will allow extra water of Cedar Creek to flow under it with a 30-foot lowering of the bed by the proposed dredging, engineers stated. The group of officials are shown in the picture standing on an island in a beautful bend of Cedar Creek that will be abandoned. This creek is the only one in Ohio with waters cold and clear enough for the raising of brook trout, though some of these were caught in Mad River this spring after they had gone down stream.

Since 1929, continued and expanded ditching and dredging have reduced the Cedar Bog habitat to only about 98 acres. Today, perhaps the richest farm land

in Champaign County has replaced most of the former wet prairie of the Mad River valley.

## NATURE OF THE CEDAR BOG HABITAT

Two physical conditions help to maintain the Bog—a cool microclimate and springs of cool ground water. Undoubtedly these two conditions are interrelated, but, in order to avoid confusion, they will be discussed separately.

### *Microclimatic Influences*

A microclimate similar to that found in northern Michigan bogs exists in Cedar Bog and must have existed from the retreat of glaciation to the present, for otherwise the Cedar Bog boreal flora would not have survived here. Records of air, water, and soil temperatures made over the past five years provide evidence that such a microclimate does exist.

#### *Temperature Stations*

During a previous study (Frederick, 1964), weekly maximum and minimum air temperatures, taken 12 inches above the soil surface, were recorded for the marl meadow about a quarter of a mile north of Woodburn Road, from February through September 1964. During the same period, maximum and minimum readings were also recorded from a thermometer located under the water surface in Cedar Run. During the last three months of 1964 and all of 1965, temperature data, including air temperatures approximately 12 inches above the soil and water temperatures in Cedar Run, were recorded for a station just south of Woodburn Road.

On December 31, 1965, a weather station, similar to the weather shelters of the U. S. Weather Bureau, was erected in the bog meadow south of Woodburn Road. Maximum-minimum thermometers, model #110, were placed at 5 feet above the soil surface inside the shelter and at 12 inches above the soil outside the shelter. In addition, a soil thermometer (not a maximum-minimum type) was set 6 inches under the soil surface beneath the shelter. A similar set of thermometers was placed in an arbor vitae stand west of Cedar Run, and a set in the swamp forest area south of Woodburn Road. In addition, a maximum-minimum thermometer was set with the sensor below the surface of the water in Cedar Run, approximately 400 feet south of Woodburn Road.

During 1966, temperature data were taken at least once a week at all stations. Official readings taken from the Urbana Weather Station's monthly summary (Climatological Data, Ohio) were used in the same manner; *i.e.*, the only temperatures used were maximum and minimum values for the periods exactly coinciding with periods between readings at the Bog. Complete and detailed data were reported by Frederick (1967).

#### *Soil Temperatures*

Mean soil temperatures from Cedar Bog are given in table 1, where they are compared with similar data from the Coshocton Agricultural Experiment Station (Clim. Data, Ohio, 1966), the only station in Ohio from which such information is available. The data thus presented may not be exactly comparable, but they do indicate that soil temperatures in Cedar Bog are significantly lower during the warm summer months than are soil temperatures elsewhere in Ohio.

The soil temperature never went below 32°F in the bog meadow and swamp forest areas. In contrast, during 17 weeks in 1966 and 1967, the soil in the arbor vitae tract was at or below freezing. During the six warmest months, however, soil temperatures in the bog meadow averaged 3.1°F higher, and in the swamp forest 2.2°F higher, than those in the arbor vitae stand. One factor in maintaining a boreal habitat may be the effect on soil temperature resulting from the presence of arbor vitae in the area.

Because water is near the surface in Cedar Bog, the water temperature undoubtedly influences soil temperatures, particularly minimum readings in the bog meadow and swamp forest regions during the winter, when insolation is at a minimum. However, changes in minimum soil temperatures lagged behind changes in water temperature by about one week. The minimum water temperature was recorded on January 29, 1966; the lowest soil temperatures in both the bog meadow and the swamp forest were recorded on February 5, 1966. These results were expected, because during winter months ground-water temperature has a greater influence on soil temperature than does insolation.

TABLE 1

*Comparison of soil temperatures (°F) at 6 inches depth in Cedar Bog and at the Coshocton Agricultural Experiment Station for 1966.*

| | Coshocton Agric. Expt. Station[1] | Cedar Bog | | |
|---|---|---|---|---|
| | | Bog meadow | Arbor vitae stand | Swamp Forest |
| Annual average monthly maximum temperatures | 64.1 | 53.7 | 51.8 | 53.8 |
| Annual average monthly minimum temperatures | 48.2 | 46.8 | 43.6 | 47.1 |
| Average maximum temperatures for 6 warmest months | 75.8 | 64.1 | 61.0 | 63.0 |
| Average minimum temperatures for 6 warmest months | 59.3 | 57.3 | 53.0 | 56.1 |
| Average maximum temperatures for 6 coolest months | 52.5 | 43.3 | 41.0 | 44.9 |
| Average minimum temperatures for 6 coolest months | 37.2 | 36.3 | 32.2 | 38.2 |
| Highest temperature recorded | 82.0 | 69.0 | 66.0 | 66.5 |
| Lowest temperature recorded | 34.0 | 33.0 | 28.0 | 34.0 |

[1]Coshocton data, U. S. Dept. Commerce, 1966.

The reverse was true of summer soil and water temperatures; the soil reached its maximum temperature before the water, the maximum water temperature occurring after a lag of two weeks or more. The highest soil temperatures in the bog meadow and the swamp forest were recorded on July 2, 1966, but the highest water temperature was recorded on July 16 (and again on July 23). This, too, would be expected, for higher soil temperatures as a result of insolation would eventually affect the temperature of the ground water as well.

The average monthly temperature of the water in Cedar Run varied from a low of 38.6°F in January to a high of 63.3°F in August. Monthly deviation was greatest from August to September, with a drop in the monthly average of 8.7°F. However, deviation from month to month through the remainder of the year averaged only 3.6°F. The highest water temperature recorded during 1966 was 73.0°F in July and the lowest was 26.0°F in January.

*Air Temperatures*

Air temperatures, average annual temperatures, and average maximum and minimum temperatures, were also recorded for 1966, and were compared with values measured at the Urbana weather station. Higher maximum temperatures occurred at the 5-foot level in the bog meadow than at the Urbana weather station, but minimum temperatures were lower than those at the weather station. With few exceptions, this was true for each weekly period throughout the year. Averag-

ing just the differences between the temperature at Cedar Bog and that at the Urbana weather station, the bog meadow temperatures at the 5-foot height averaged 3.1°F higher for the maximum temperatures and 3.3°F lower for the minimum temperatures in 1966.

The extremes at the 12-inch level in the bog meadow were even greater. The minimums were lower than at both the Urbana and the Bog weather stations every month except August, and the maximums were higher than at both stations eight months of the year.

The arbor vitae areas had less extreme more constant air temperatures than did any other area of the Bog. Temperatures were always lower here during the summer, both at 5 feet and at 12 inches, than at either the bog meadow or Urbana weather stations. Temperatures at 12 inches were lower than those at 5 feet. But, more important, during the winter months, minimum temperatures were higher and, in the summer, maximum temperatures were lower in the arbor vitae association than in the bog meadow.

Temperatures in the swamp forest showed greater variation than did those in the arbor vitae area, but were less extreme than those in the bog meadow. In general, temperatures were cooler at the 12-inch level than at 5 feet.

Some annual comparisons can be made of temperatures in different areas of Cedar Bog by averaging the degrees departure of temperatures in Cedar Bog from those at the Urbana weather station. In 1964, temperatures were recorded at 12 inches above the soil in the marl meadow association. Compared to official weather bureau temperatures taken at Urbana, the maximum temperatures in the marl meadow averaged 3.5°F higher and minimum temperatures 5.4°F lower than the weather station values.

During 1965, temperatures were recorded at 12 inches above the soil in the bog meadow near the east bank of Cedar Run. Because it was near the stream, which never freezes, temperatures should have been modified by the water. However, the maximum temperatures were 3.48°F higher and the minimum temperatures 6.74°F lower than those at the Urbana weather station.

In 1966, temperatures averaged 3.5°F higher and the minimums 7.0°F lower 12 inches above the soil at the weather station in Cedar Bog. This weather station stands in an exposed area about 5 feet higher than the surface of Cedar Run. Despite this, during the winter, the soil in the area of the Bog weather station was not frozen at a depth of 6 inches. Seepage areas continued to run throughout the winter, although a hard crust of ice sometimes formed at the surface. Cedar Run never froze, except for an occasional very thin sheet of ice close to the bank. During very cold weather, Cedar Run appeared to "steam," because of the great differences in air and water temperatures. As a result, then, even when air temperatures at 5.4 to 7.0°F lower, plant roots are not frozen, and water is present in and on the soil at all times of the year.

Perhaps the most dramatic evidence for a cold microclimate in Cedar Bog concerns the absolute temperature extremes and the length of the frost-free period. During the winter of 1964–65, a low of −25°F was recorded in the marl meadow, although the Urbana weather station reported −10°F as the lowest temperature for that period. A temperature of −26°F on January 16, 1873 (Alexander, 1923), is the lowest ever recorded officially in Champaign County. In 1964 the highest temperature recorded in Cedar Bog was 101°F between August 2 and 9; the temperature fell to 31°F the following week. The extremes at the Urbana weather station for the same period were 95°F and 38°F.

A comparison of the frost-free period for Cedar Bog with that recorded at the Urbana weather station, assuming that the minimum temperature recorded in the Bog during any one period occurred on the same day as the minimum for that same period at the Urbana weather station, is quite revealing (table 2). No complete data are available for 1968, but, based on previous temperature differentials, the

frost-free period at the 5-foot level was about 97 days and at the 12-inch level, 84 days, in contrast to the 152 frost-free days reported at the Urbana weather station.

Values for 1966 may not be typical. With regard to this year, the state climatologist noted that, on May 9, "overnight lows were in the twenties in all cooperative temperature recording stations except Ashtabula. Mean surface temperatures on the 10th were 15° to 22° below normal." Record low temperatures were observed throughout the state, with stations recording the lowest

TABLE 2
*Frost-free periods, Urbana Weather Station and Cedar Bog for five years*

| | Last frost in spring | | First frost in fall | | No. frost-free days |
|---|---|---|---|---|---|
| | Date | °F | Date | °F | |
| 1964 | | | | | |
| Urbana weather station | 4/11 | 29 | 9/13 | 32 | 155 |
| Cedar Bog, 12-inch level | 5/30 | 28 | 8/15 | 31 | 76 |
| 1965 | | | | | |
| Urbana weather station | 4/19 | 31 | 10/4 | 32 | 168 |
| Cedar Bog, 12-inch level | 5/28 | 31 | 8/3 | 30 | 66 |
| 1966 | | | | | |
| Urbana weather station | 5/10 | 25 | 10/2 | 30 | 138 |
| Cedar Bog, 5-foot level | 6/2 | 32 | 9/16 | 31 | 105 |
| Cedar Bog, 12-inch level | 6/11 | 32 | 9/16 | 27 | 96 |
| 1967 | | | | | |
| Urbana weather station | 5/10 | 32 | 9/23 | 31 | 136 |
| Cedar Bog, 5-foot level | 5/23 | 32 | 9/1 | 28 | 99 |
| Cedar Bog, 12-inch level | 5/23 | 27 | 9/1 | 26 | 99 |
| 1969 | | | | | |
| Urbana weather station | 5/1 | 32 | 10/15 | 27 | 167 |
| Cedar Bog, 5-foot level | 6/16 | 32 | 10/9 | 30 | 118 |
| Cedar Bog, 12-inch level | 6/16 | 31 | 9/10 | 32 | 85 |

ever reported in May (Clim. Data, Ohio, May, 1966). In addition, September was unseasonably cool; on September 16, frost was reported in some areas of Ohio (Clim. Data, Ohio, September, 1966). From these reports, data from 1964, 1965, and 1969 probably are more typical for Cedar Bog. The frost-free period in Cedar Bog, based on data from the years listed above, is approximately two to two and one-half months shorter than in the surrounding countryside. July is the only month that has been frost-free throughout the period of this study. Cedar Bog is down in a valley, with low hills on either side, and low air-temperatures result, at least in part, from flowage of cold air downslope to the Bog site.

There can be no question that the microclimate in Cedar Bog is much more severe than in adjoining areas. Surely this microclimate has been an important factor in the survival of a boreal bog in this part of Ohio.

### *Water Supply and Source*

Another important factor in the survival and maintenance of the Cedar Bog habitat is the constant, relatively cool water supply. Not only does this cool water influence the habitat directly, but it undoubtedly also plays a role in creating the unusual and essential microclimate described earlier.

The maximum water temperature in Cedar Run during 1964 was 78°F and the minimum was 22°F, the mean temperature for the year was 49.7°F. In 1965 the average temperature was 48.2°F, with a high reading of 78°F and a low reading

of 22°F. In 1966 the maximum temperature recorded was 73°F and the minimum 26°F, with an annual average temperature of 48.9°F. At no time did the water in Cedar Run freeze, even at 22°F. Large quantities of calcium carbonate and other salts (Frederick, 1964) and the constant motion of the water are responsible for the continuing flow. In addition, the temperature extremes apparently occur for only a very short period of time (Frederick, 1964).

The Mad River and its tributaries have been noted as a constant water source from pioneer times. Morgan (*in* Antrim, 1872) said of the Mad River, Kings Creek, and Mac-O-Chee Creek, "all these are permanent, never-failing streams of pure, clear water. They have never been known to go dry in summer, and always furnish an ample supply of water for milling purposes throughout the year." Howe (1889) described the Mad River at Springfield in 1846 as "unequalled for fine mill seats, its current very rapid and the water never so low in the driest season as to interfere with the mills now upon it."

Today the Mad River valley in Champaign and Clark Counties is noted for the abundant water available to cities and industry. In discussing the water resources of Clark County, Cross (*in* Norris *et al.*, 1952) cited the high sustained stream flow even during droughts as the outstanding characteristic of the Mad River. He also established that this even flow is sustained because a major percentage of the total runoff is from ground water, rather than from surface runoff.

Goldthwait (Norris *et al.*, 1952) pointed out that the best places for large ground-water development are adjacent to streams with valley-train deposits, because rain water, as well as water from the stream, infiltrates and recharges these deposits. Such valley-train deposits are very extensive in the Mad River valley (Goldthwait, personal communication, 1966, and Norris *et al.*, 1952), so the amount of water held in the ground here is very great. In addition, ground water evaporates only very slowly, so little of the water is lost, and the water emerges as continuously flowing springs wherever a low place is present at the surface. This, then, accounts for the relatively high rate of flow of the Mad River and its tributaries during periods of brought, as well as for the reasonably constant flow during rainy periods. These same factors also account for the constant water level in Cedar Bog, because ground water from the valley train feeds the low area of the Bog, just as it does the Mad River. Also, because the water is underground, it does not become sun-warmed, and so, during the summer (the growing season), it emerges cooler than surface waters.

The water level in Cedar Bog does not vary more than a few inches, even when the water table is lowered three or four feet near Urbana. This constant supply of relatively cool ground water is, and doubtless has been throughout the centuries since glacial times, an important factor in the formation and survival of the bog habitat in Cedar Bog. Indeed, most of the critical microclimatic conditions described earlier owe their existence to the continued emergence of this cool ground water.

In summary, Cedar Bog originated as a result of its geologic history and has survived because of the constant cool water supply and the existing cool microclimate. The future of the Bog is, therefore, dependent upon continued maintenance of the water supply. If the assumptions made above are correct, either of the following events, if they should occur, would destroy the habitat. (1) The addition of sun-warmed surface drainage into the Bog could so change the character of the water, as well as the movement of water in the area, as to change completely the present habitat and to destroy most of the flora. (2) If the level of the water table in the valley-train deposits were lowered enough so that seepage from the ground water did not occur, all swampiness could cease, the critical local microclimate would be lost, and the Bog flora would be destroyed.

Although new factories have been developed both north and south of Cedar Bog, and a new municipal well has been dug for the city of Urbana, Ohio, the

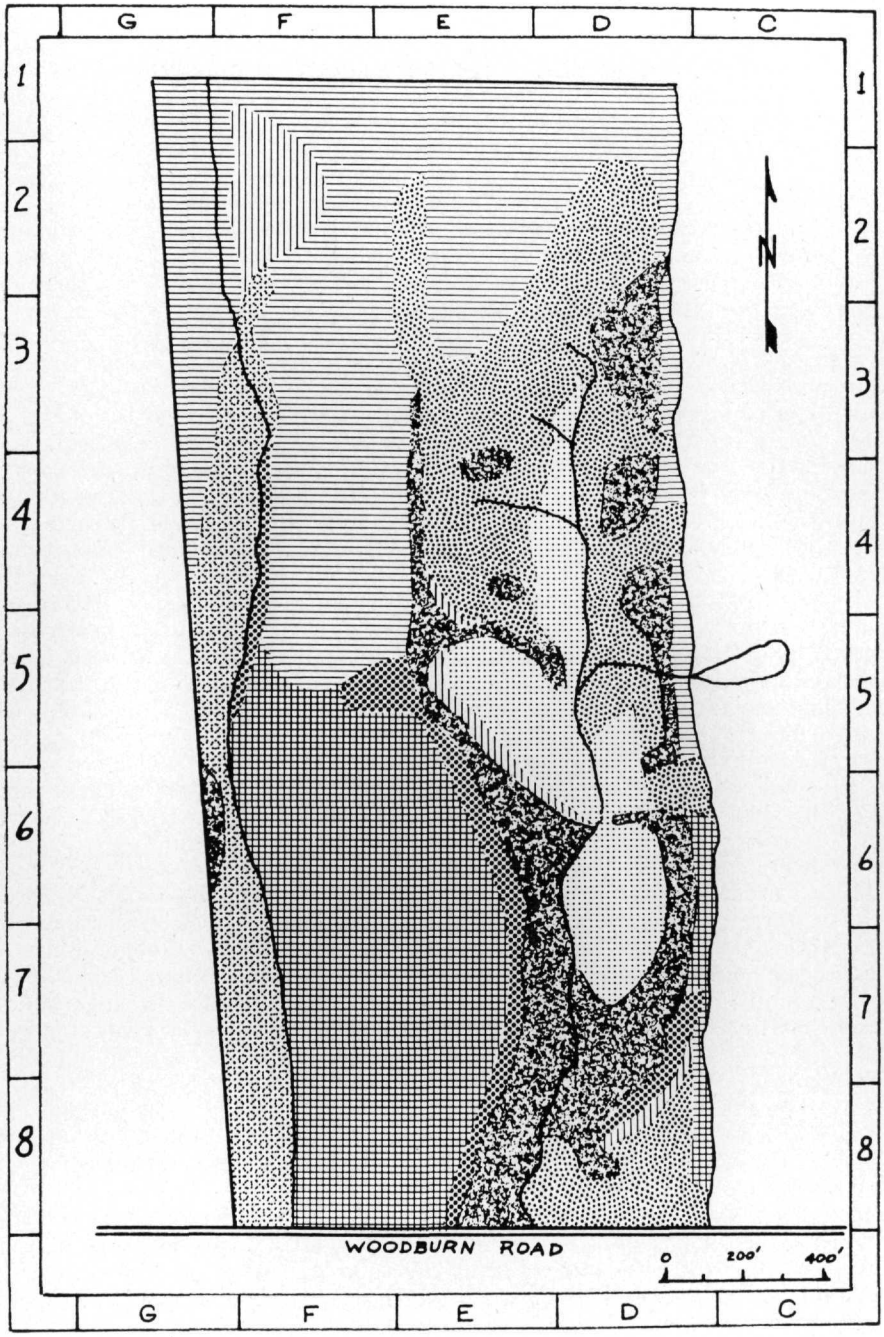


FIGURE 2. Vegetation map of study area of Cedar Bog north of Woodburn Road, with location grid. Symbols as in figure 3.

water in the Bog has not lowered appreciably. In fact, the water level during the summers of 1969 and 1970 appeared to be somewhat higher than it had been in 1965 and 1966 (a pattern in ground-water levels that was also observed elsewhere in the state—J. L. Forsyth, personal communication, 1973). Admittedly, eight years is a short period in which to observe the conditions maintaining the Bog. Nonetheless, significant lowering in level of the water table in the Mad River valley could destroy Cedar Bog in the future.

## PLANT ASSOCIATIONS IN CEDAR BOG

Establishment of the basic plant associations in the Bog was essential in order to give an overview of the flora and to provide a method for describing habitats and locations of plant species. Six basic associations, which are described briefly below (and for which detailed information may be found in Frederick, 1964 and 1967), were defined. The term "association" here is used to indicate a major category of vegetation, influenced more or less uniformly throughout by water level and microclimatic characteristics, as well as by the kinds of plants found there.

Plant associations were mapped only within the main part of Cedar bog (figs. 2 and 3). Mapping was not carried east of the low escarpment near the railroad embankments nor far west of the unnamed stream in the west (referred to here as West Branch), except for the southwest corner, where there is a broad westward extension of swamp forest (referred to here as the "western extension").

The plant associations identified (figs. 2 and 3) are:

1. the bog meadow association, found along Cedar Run in the eastern part of the Bog;
2. the marl meadow association, found in the wetter parts of the Bog, where marl is present;
3. the arbor vitae association, found around the margins of the bog meadow and marl meadow;
4. the swamp forest association, found generally west of the arbor vitae;
5. the hardwood forest association, occurring west of the swamp forest; and
6. the shrub communities, occurring through much of the bog, but mapped separately, as an association, only where shrubs dominate the vegetation, along the boundaries between the marl meadow and arbor vitae associations.

Several of these main plant associations are subdivided into separate segregates, or local variations in vegetational type, within the association.

Although listing of these categories suggests that they are delimited by sharp boundaries, no clear-cut change occurs between most of these vegetational types in the Bog; boundaries are generally gradational or ecotonal in character. In addition, even though a species is named as a dominant in one association, that does not mean that it is absent in other associations, even though it is not included in the list of most characteristic species for them. For example, spicebush (*Lindera benzoin*) is found in most of the associations, but is mentioned as dominant only in the shrub association. Measurements of trees are given as inches DBH (diameter at breast height) and were measured, unless otherwise stated, approximately 4½ feet above the ground.

### *The Bog Meadow Association*

The bog meadow is located east of Cedar Run (fig. 4), both north and south of Woodburn Road, and also northwest of the northern reaches of Cedar Run. Water is found abundantly throughout this area at or near the surface: in Cedar

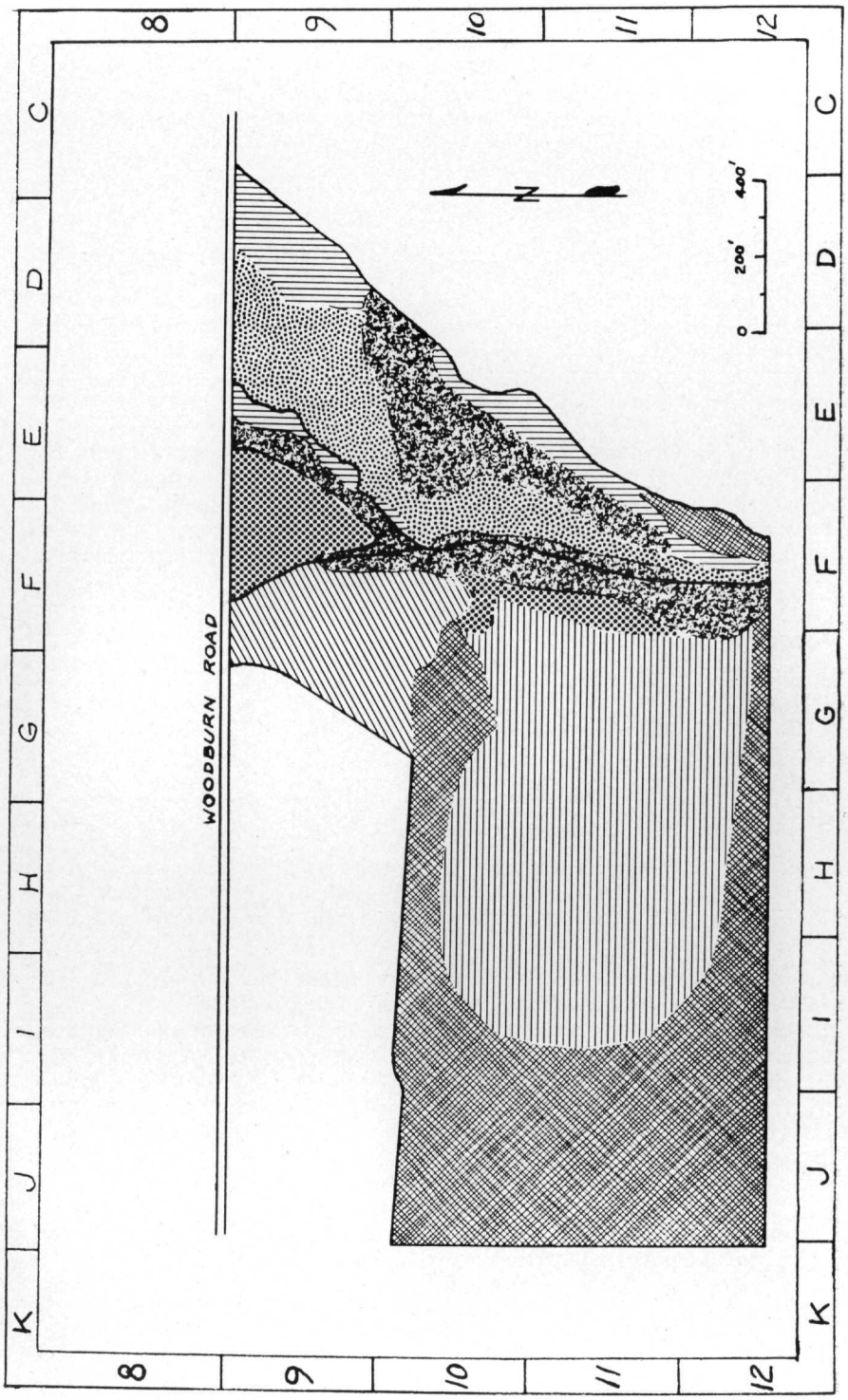


FIGURE 3

EXPLANATION OF FIGURE 3

FIGURE 3. Vegetation map of study area of Cedar Bog south of Woodburn Road, with location grid. Symbols identify plant associations in figures 2 and 3: fine dots, marl meadow association; heavier dots, bog meadow association; splotched pattern, arbor vitae association; horizontal lines, swamp forest association (elm-ash-maple); vertical crisscross lines, swamp forest association (maple-ash-basswood); diagonal lines, swamp forest association (young silver maple); heavier diagonally arranged dots, swamp forest association (tuliptree stands); diagonal crisscross lines, hardwood forest association (beech-maple); pattern of dotted x's and o's, hardwood forest association (oak-maple); and vertical lines, shrub communities.

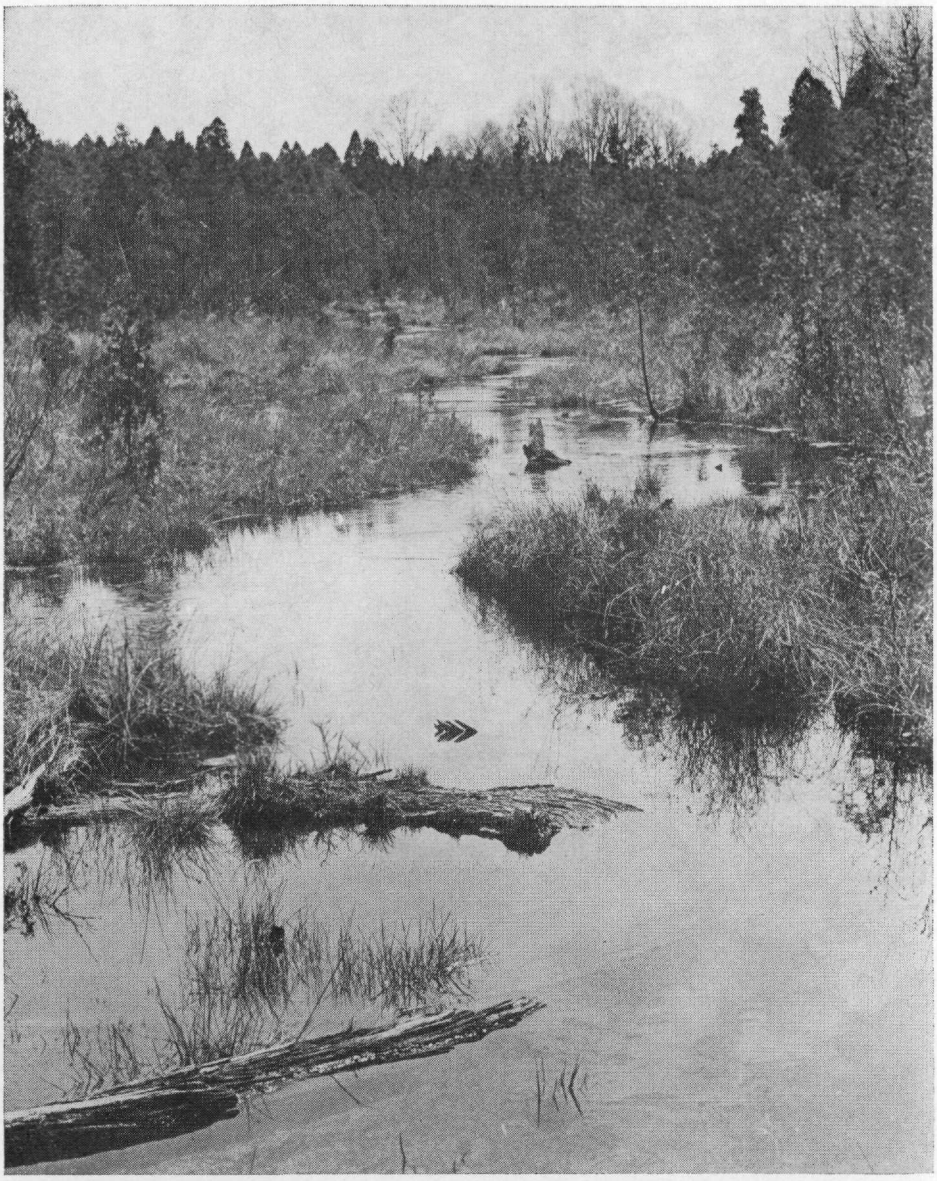

FIGURE 4. Cedar Run, with bog meadow around it, hemmed in by arbor vitae and, in the distance, other swamp-forest species. Photo courtesy of John F. Gallagher.

Run (fig. 4), in small tributaries to Cedar Run, and in standing water at the surface. The soil is a mixture of peat and marl, which, because of its saturation, tends to quake.

Here in the bog meadow are found a greater number of different plant species than occur in any other areas of the Bog. The bog meadow is characterized by many species of sedges and grasses, which form raised hummocks, and by shrubby cinquefoil (*Potentilla fruticosa*), ninebark (*Physocarpus opulifolius*), dogwood (*Cornus* spp.), and swamp birch (*Betula pumila*). Cedar Bog marks the southernmost occurrence of this last species, a species seldom found south of the bogs of central Michigan. Small arbor vitae (*Thuja occidentalis*) trees are found growing on many of the slightly higher, larger hummocks near the margins of the meadow.

Many herbaceous species are also found in the bog meadow: the fringed gentian (*Gentiana crinita*), the marsh fern (*Thelypteris palustris*), Kalm's lobelia (*Lobelia kalmii*), grass-of-parnassus (*Parnassia glauca*), marsh violet (*Viola cucullata*), lousewort (*Pedicularis canadensis*), nodding onion (*Allium cernuum*), swamp candle (*Sanguisorba canadensis*), queen-of-the-prairie (*Filipendula rubra*), and many composites, including eupatoriums, goldenrods, asters, sunflowers, and rudbeckias.

Near the eastern margin of the bog meadow, just north of Woodburn Road, even though the soil is similar, the water level is lower, making the substrate slightly better drained, so some deciduous trees have become established. The main deciduous species are: tuliptree (*Liriodendron tulipifera*), prickly ash (*Xanthoxylum americanum*), dogwood (*Cornus alternifolia*), and several species of *Rubus*. Herbaceous plants in this area include wild columbine (*Aquilegia canadense*), ironweed (*Vernonia missourica*), bull thistle (*Cirsium vulgare*), horse mint (*Monarda fistulosa*), and several species of asters, goldenrods, and eupatoriums.

At the present time, many small arbor vitae are beginning to become established on the hummocks in the bog meadow. In the future, especially if the water table is allowed to become lowered, these bog meadow tracts may become well-developed arbor vitae forest areas, resulting in the loss of both the bog meadow and its unique species.

### *The Marl Meadow Association*

The marl meadow is located along Cedar Run about one-quarter mile north of Woodburn Road and covers an area of approximately four acres (fig. 5). It is flat, with marl at the surface throughout the entire tract. Water is always at or above the soil surface, creating extensive areas of standing water. The marl is no doubt what local residents mean when they speak of "quicksand" in Cedar Bog. Demonstrating the extremely porous nature of the area, a one-inch rod or stick can easily be pushed into the ground to a depth of three or four feet.

Plant life in the marl meadow presents a different aspect during each season of the year. In early spring, *Triglochin maritima* is dominant, with flowering scapes appearing in every section of the tract. In May and June, sedges (*Carex* spp. and *Eleocharis* spp.) and *Juncus* spp. are dominant, with species of *Eriophorum* on slightly higher parts of the meadow and *Utricularia cornutum* in areas of standing water. In June *Calopogon pulchellus* flowers throughout the marl meadow and *Cacalia tuberosa* and *Krigia biflora* are also in bloom.

In July the white camass (*Zigadenus glaucus*), false asphodel (*Tofieldia glutinosa*), *Campanula aparinodes*, and blazing star (*Liatris spicata*) are found in abundance throughout the marl meadow. In August, *Potentilla fruticosa*, *Silphium* spp., *Rudbeckia* spp., *Bidens* spp., *Cirsium muticum*, and *Solidago* spp. are in bloom, particularly on the margins of and on slightly higher hummocks within the marl meadow. In September, *Helenium autumnale*, white snakeroot (*Eupatorium rugosum*), and many species of asters and goldenrods are in bloom, and fringed gentians (*Gentiana crinita*) are found in abudance on hummocks.

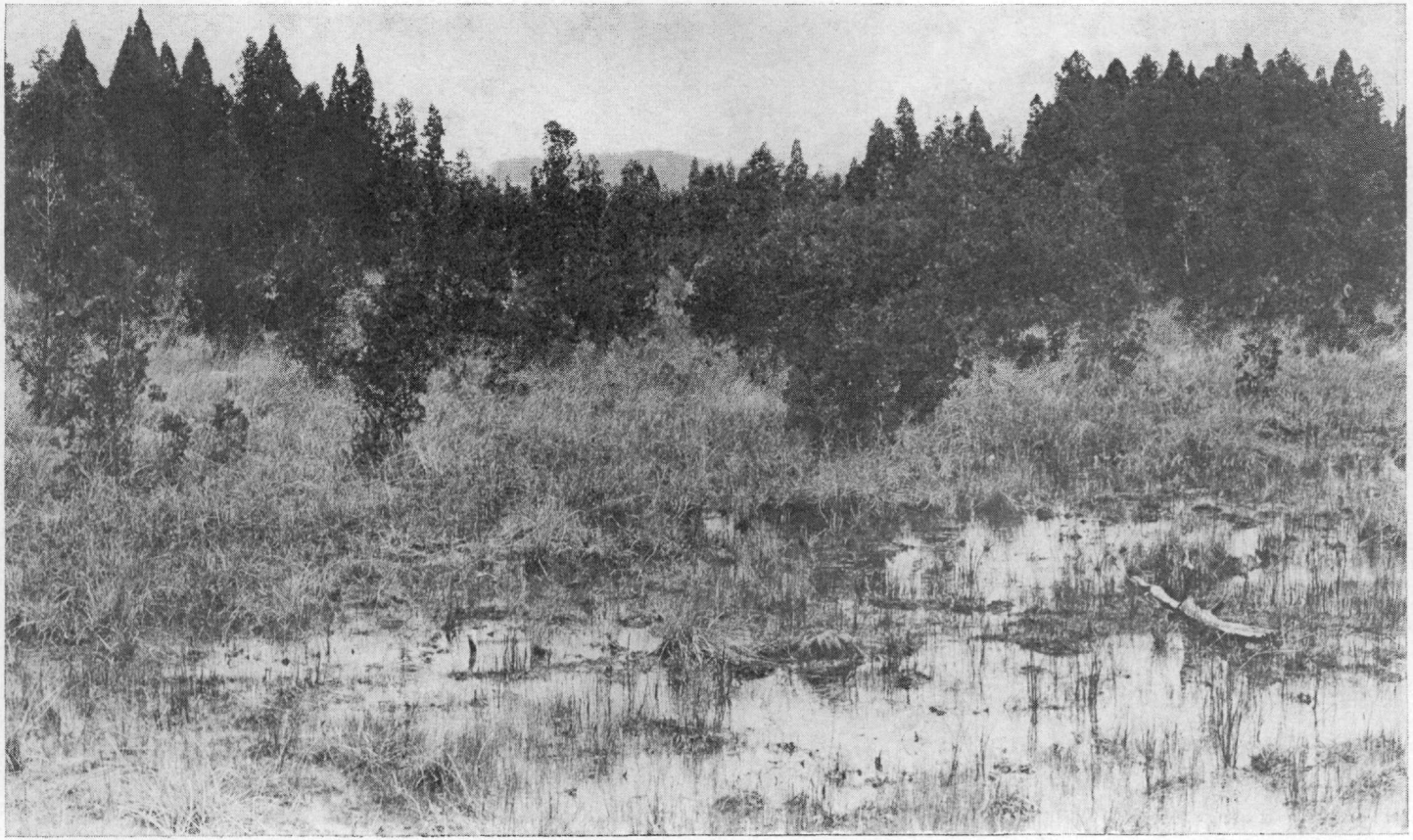

FIGURE 5. View of four of the plant associations in Cedar Bog, looking west. Marl meadow is in foreground, with bog meadow just beyond, arbor vitae still farther beyond, and the canopy of the swamp forest rising above the arbor vitae in the distance. Photo courtesy of John F. Gallagher.

Two factors influence plant survival in the marl meadow. First, although air temperatures in the marl meadow (and also in the bog meadow) show great extremes, soil temperatures are uniformly cool at the root level. Second, the wet cool marly environment is not easily invaded by other species, so that northern species have survived because of little or no "competition." If the level and coolness of the water are maintained, the present vegetation should remain much as it is now; if the water table should lower, however, arbor vitae trees would invade the marl meadow and many of these unique herbaceous species would disappear.

### *The Arbor Vitae Association*

Arbor vitae (*Thuja occidentalis*) trees are present outside the bog meadow on either side of Cedar Run (figs. 4, 5, and 6), though the relative density of *Thuja* in the stands east of the run is higher than in those to the west, where some deciduous trees, such as tuliptree and ash, also occur. The presence and character of the herbaceous layer also differ in different arbor vitae stands, depending on

FIGURE 6. View of a narrow band of arbor vitae trees at the edge of the bog meadow north of Woodburn Road, with tuliptrees standing beyond the arbor vitae. Photo courtesy of John F. Gallagher.

the age and density of the trees and the water level in the particular area. Soils are formed by the accumulation of peaty organic materials on top of *Thuja* roots. Where these peaty materials are thicker, the substrate is slightly higher and less wet.

Some of the largest and oldest arbor vitae trees are found east of Cedar Run and north of Woodburn Road (D–7). Although some trees are smaller, the ma-

jority measure 8½ to 17½ inches DBH. In this area, which is low and wet, there is practically no ground cover except for liverworts (*Conocephalum* spp.) and some depauperate deciduous tree seedlings, none of which seem to survive. In slightly less wet stands of arbor vitae, on ground only a few inches higher, the herbaceous species may include Canada mayflower (*Maianthemum canadense*), partridgeberry (*Mitchella repens*), a few jack-in-the-pulpits (*Arisaema atrorubens*), and an occasional spikenard (*Aralia racemosa*). Where the ground is slightly higher yet, more herbaceous plants occur: the bulblet fern (*Cystopteris bulbifera*), violets of several species (*Viola* spp.), *Maianthemum canadense, Trientalis americana, Habenaria clavellata,* and many mosses and lichens, with the swamp thistle (*Cirsium muticum*) and swamp milkweed (*Ascelpias incarnata*) around the margins of the stand. In younger, more dense stands of arbor vitae farther upstream and bordering the marl meadow on the northeast, the soil is still drier and only the litter of fallen arbor vitae foliage covers the ground; not even *Conocephalum* is present.

West of Cedar Run, arbor vitae stands have a great many more associated plants. The plants found here (E–8, D–7) include *Habenaria clavellata, H. psycodes, Spiranthes ovalis, Cypripedium calceolus* var. *parviflorum, Rubus pubescens, Anemonella thalictroides, Hepatica americana, Viola* spp., *Equisetum arvense, Cystopteris bulbifera, Mitella diphylla,* and occasionally *M. nuda.* Few shrubs occur here, except for *Hydrangea arborescens* and *Lindera benzoin.* One plant of *Osmunda regalis* was found in this area (D–7), as was one group each of *Polypodium virginianum* and *Camptosorus rhizophyllus,* growing on downed *Thuja* logs. West of West Branch (G–6, 7), there is also one small area of arbor vitae, where the trees, widely separated, are apparently remnants of a once-larger stand, occurring in two swales, or low seepage areas, that drain into West Branch.

South of Woodburn Road, the arbor vitae trees are generally smaller than are those to the north. In some places here, the arbor vitae form solid stands; elsewhere, many herbaceous plants grow under the trees: swamp thistle (*Cirsium muticum*), wingstem (*Actinomeris alternifolius*), bulbet fern (*Cystopteris bulbifera*), horsetail (*Equisteum arvense*), and grass-of-parnassus (*Parnassia glauca*). On the west bank of Cedar Run, ninebark (*Physocarpus opulifolius*) leans out over the stream. This bank is drier than land away from the stream, probably as a result of the past dredging of Cedar Run to the south. Some of the more unusual plants found here are the orchid *Habenaria clavellata,* partridgeberry (*Mitchella repens*), and sundew (*Drosera rotundifolia*) (fig. 7). Although sundew is not rare in Cedar Bog, one colony, six to eight inches across, was seen, flowering abundantly, growing on the base of an arbor vitae tree here, beside a seepage area.

Far to the south (in E–11), the trees are especially young and are commonly interspersed with deciduous shrubs, such as dwarf birch (*Betula pumila*), alder (*Alnus rugosa*), shrubby cinquefoil (*Potentilla fruticosa*), and several species of dogwood (*Cornus* spp.), or with small patches of bog meadow plants. Eventually the arbor vitae will probably overtop the deciduous shrubs, and this area, too, may become a pure stand of arbor vitae.

There is evidence in this area (E–9) that large arbor vitae trees were cut. Several stumps remain, and one, although partially destroyed, has a diameter of approximately 15 inches. In addition, some genera (*Clintonia, Gautheria,* and *Hexastylis*) have been planted here, on the raised area over the roots of an arbor vitae, by some overzealous naturalists, probably with the mistaken view that, because these plants are normally found in this habitat, they should be planted and preserved in Cedar Bog (Carl Horst, personal communication, 1964).

To the south, along Cedar Run, the trees are so close together and cathedral-like that it is difficult to walk through the stand. It is in this region that many of the trees were toppled by strong winds (worst damage in northeast F–10, southeast F–11, and eastern F–12). In the tangled thicket which resulted, some arbor

vitae are still living, but blackberry, ninebark, dogwood, and even giant bluestem grass have come in among the downed trees. As a result of the wind damage, trees south of Woodburn Road are generally smaller than are those to the north, but trees of 12, 13, and 14½ inches DBH were measured here. One large downed arbor vitae log measured 25 inches at a distance of 4½ feet from the base. Three new trees have developed from the branches of the fallen tree, the largest having a DBH of 10¼ inches. New trees frequently develop from branches of downed logs of arbor vitae, some of considerable size (11½ inches DBH). Many trees of this species in the Bog have originated in this way.

The *Thuja* stands once occupied a much larger area in the Mad River valley (Dachnowski, 1910), but, aside from the stands in the Cedar Bog Nature Preserve, very few arbor vitae trees now remain. Where arbor vitae once extended southward along Cedar Run as far as its mouth into the Mad River in Clark County (Evans, 1944), none occurs south of about a mile south of Dallas Road today.

FIGURE 7. Close-up of sundew (*Drosera rotundifolia*) in Cedar Bog. Photo courtesy of John F. Gallagher.

### *Swamp Forest Association*

Swamp forest occupies by far the greatest area in Cedar Bog (figs. 2 and 3). There are at least five distinct segregates and considerable variation from area to area within the association. All areas of swamp forest lie west of Cedar Run. Elms, which once dominated most of the swamp forest, have largely been eliminated by the Dutch elm disease, though their gaunt remains are still evident in the more open stands.

Just north of Woodburn Road, the swamp forest association, here represented by a maple-ash-basswood stand, occupies the large central area of the Cedar Bog Nature Preserve west of the bog meadow and arbor vitae areas. Ash, basswood (*Tilia americana*), and musclewood or blue beech (*Carpinus caroliniana*) are numerous through the area, as elm must have been once, judging from the many large elm stumps. On the west margin are tuliptrees (*Liriodendron tulipifera*),

swamp white oak (*Quercus bicolor*), some relatively large butternut trees (*Juglans cinerea*), a few mature wild cherries (*Prunus serotina*), and, toward the north end, some large red maples (*Acer rubrum*). Some tuliptrees were measured from 31 to 34½ inches DBH and one swamp white oak at 26 inches DBH. In one place on the east bank of West Branch, six tuliptrees, one quite large, grow so close together that, although no evidence remains, all must have originated from the same single ancient stump.

Shrubs in this section are mainly spicebush, elderberry, and dogwood, although a few shrubs of *Prunus* and *Crataegus* are scattered throughout. Herbs include *Hepatica*, *Allaria*, species of *Thalictrum*, a few lilies (*Lilium michiganense*), species of *Desmodium*, and wild yam (*Dioscorea villosa*). In the slightly drier and more open areas are many composites: *Helianthus giganteus*, *Eupatorium rugosum*, *Rudbeckia laciniata*, *Senecio aureus*, *Erigeron* spp., *Aster simplex*, and *Actionomeris alternifolius*.

North of this stand is an elm-maple stand (D–, E–, F–, and G–1, 2, 3, and 4), once dominated by elms, now mostly dead, and presently characterized mostly by thickets of *Cornus* and *Rubus* and six-foot-tall stinging nettles, over which species of *Galium* clamber, making the area almost impassable. Relatively large red maples are widely scattered throughout the area, as well as one large sycamore and a few mature tuliptrees, but no seedlings of these trees are now evident. On the west margin are several butternut seedlings and a few oak trees, *Quercus imbricaria* and *Q. muehlenbergii*, and on the north are one large old red elm, several relatively large ash trees, and some *Prunus*.

South of Woodburn Road an area (G–11 and 12) of swamp forest called elm-ash-maple is composed of red and silver maple (*Acer rubrum* and *A. saccharinum*) and black and green ash (*Fraxinus nigra* and *F. pennsylvanica* var. *subintegerrima*), with many large tuliptrees (*Liriodendron tulipifera*) along the eastern edge. Shrubs found in this area are mainly blackberry, spicebush, and some Canadian taxus. Head-high stinging nettles are present, as are ferns—*Dryopteris*, silvery glade fern (*Athyrium thelypterioides*), and many large beautiful cinnamon ferns (*Osmunda cinnamomea*), some with fronds five feet long or more. Evans (1944) reported that, in 1924, florists paid local residents to dig up these handsome plants for commercial use.

Just west of this area (in H– and I–10, 11, and 12), the big elms are now dead, but in the late summer of 1962, the elms were alive and appeared vigorous; there was no shrub understory at that time, except for one area of spicebush (H–10 and 11) and a few herbaceous plants: ebony spleenwort (*Asplenium platyneuron*), several species of *Dryopteris*, and a few asters and goldenrods. Only three years later, in the summer of 1965, this same region was an almost-impenetrable thicket of nettles, blackberries, spicebush, shrubby dogwoods, and *Actionomeris*. Ferns had become rare and the elms were dead, with some blown over, their places taken by scattered sycamores and silver and red maples. Probably within 20 or 25 years these new trees will overtop the shrubs and herbs, and the area will again become mature swamp forest.

The young-silver-and-red-maple segregate, which also lies south of Woodburn Road (F– and G–9), represents an early successional stage in the swamp forest association. When I visited Cedar Bog in the late 1940's, there were no woody plants in this tract, except for one large cottonwood and one stand of silky dogwood (*Cornus obliqua*), and the area was dominated by tall grasses and horseweed. Now there are mainly young maple trees here, trees no more than 20 years old, which will ultimately form the mature forest canopy. There is no shrub understory, but some ferns are present. Several different herbaceous species occur here, primarily violets (*Viola* spp.), garlic mustard (*Allaria officinalis*), several Umbelliferae (*Thaspium*, *Sanicula*, and *Osmorhiza*), Greek valerian (*Polemonium reptans*), and colonies of wood anemone (*Anemone quinquefolia*). In every somewhat-open area, touch-me-not (*Impatiens capensis*) is waist-high from mid-summer until

frost. One large sycamore occurs at the margin of the area along Woodburn Road.

Two stands dominated by tuliptrees occur in the Bog. In the tuliptree community south of Woodburn Road (F–9) the soil is largely peat and remains wet or damp throughout the year. Even though I have never seen ponded water here, skunk cabbage (*Symplocarpus foetidus*) grows everywhere. Other herbaceous species abundant in this community are: *Hepatica americana, Anemonella thalictroides, Viola* spp., *Oxypolis rigidior,* and *Eupatorium rugosum.* The principal shrubs are spicebush and elderberry, with extremely large vigorous stalks of poison ivy (*Rhus radicans*) growing up many large (24 to 30 inches DBH) trunks of tuliptrees. Nannyberry (*Viburnum lentago*), *Hypericum spathulatum,* and *Cornus* spp. are also present, with grape vines (*Vitis riparis*), virgin's bower clematis (*Clematis virginiana*), and wild yam (*Dioscorea villosa*) clambering over all.

The tuliptrees in the stand farther south and to the east (F–10 and 11) are also old; one ancient trunk measures 34½ inches DBH. In this area, there is a mixture of tree species: maple, ash, and a few arbor vitae, but the largest trees are the tuliptrees. Also present are ferns, *Eupatorium* spp., mosses, a few goldenrods and asters, *Oxypolis,* and dwarf raspberry.

### *The Hardwood Forest Association*

There are two distinctly different hardwood forest segregates in Cedar Bog (figs. 2 and 3), differing both in species and in aspect. The largest trees and the greatest diversity are found in the beech-maple segregate, which occurs south of Woodburn Road at the west end of the western extension. The other hardwood forest is composed of slightly younger (though mature) trees of oak and maple, and occurs north of Woodburn Road along the west bank of West Branch.

The beech-maple segregate is composed of a number of hardwood species—beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), and several species of hickory and oak. Though a number of large beech trees are present, there are no young trees, except for small root sprouts; in contrast, maple reproduction is well established. Hickories present are shagbark (*Carya ovata*), sweet pignut (*C. glabra* and *C. ovalis*), and one specimen of mockernut (*C. tomentosa*). Identification of hickory species in Cedar Bog has not been easy; Dr. A. B. Ream, of Mechanicsburg, Ohio, whose hobby is cultivating nut trees, believes that hybridization and introgression have resulted in practically every hickory tree having some characteristics of at least two species (Dr. A. B. Ream, personal communication, 1964). The most common species of oak present is swamp white oak (*Quercus bicolor*), but chinquapin oak (*Q. muehlenbergii*) and several trees identified as Schumard's red oak (*Q. schumardii*) are also present. No typical red oak (*Q. borealis* var. *maxima*) is found in this part of the Bog, but some specimens appear to be hybrids of the northern red oak. Other tree species present in this area are red maple (*Acer rubrum*), elm (mostly red elm, *Ulmus rubra*), hackberry (*Celtis occidentalis*), some small Ohio buckeyes (*Aesculus glabra*), several hawthorns (*Crataegus* spp.), and one honey locust (*Gleditsia triacanthos*).

Many of the individual trees of all species composing the canopy are very large. Examples of maximum diameters measured are:

| | inches DBH |
|---|---|
| beech | 33¼ |
| sugar maple | 46½ and 40 |
| shagbark hickory | 25½ and 27 |
| swamp white oak | 34 |
| Shumard's red oak | 32, 34½, and 41 |
| red elm | 31 |
| buckeye | 7 |

A shrub understory is not common, but where present, is composed of spicebush, prickly ash, dogwood, and, in a few places, blackberry. Herbaceous plants, which thickly cover the ground under the deciduous trees, are mainly violets, garlic mustard (*Allaria officinalis*), wake robin (*Trillium sessile*), phlox (*Phlox divaricata*), running strawberry vine (*Euonymus obovatus*), myrtle (*Vinca minor*), a few sedges, and many grasses and mosses. In late fall, asters (particularly *Aster simplex*), a few goldenrods (*Solidago* spp.) and clammy leafcup (*Polymnia canadensis*) are in flower. Vines are frequent, the most common being *Smilax rotundifolia*, *Polygonum scandens*, *Rhus radicans*, and two species of *Vitis*. Wild leek (*Allium tricoccum*) is abundant, and one colony of the orchid *Aplectrum hyemale* was found.

The other hardwood forest, the oak-maple segregate, occurring north of Woodburn Road and west of West Branch (F– and G–2 through 8), is composed of several species of oak and maple. These trees are widely separated, much smaller, and obviously younger (though nonetheless mature) than those in the beech-maple stand south of Woodburn Road and have a denser shrub understory and fewer flowering plants on the forest floor. Characteristic tree species present are chinquapin oak, swamp white oak, at least one clearly identifiable red oak, and both silver and red maple.

Far to the north (F–2 and 3), there is shingle oak (*Quercus imbricaria*), Shumard's red oak, and one tree that very closely resembles swamp chestnut oak (*Q.* michauxii). In addition, there are here: one black walnut tree (7 inches DBH) (F–5 and 6) with several seedling walnuts, butternut seedlings (*Juglans cinerea*), wild cherry (*Prunus serotina*), red and black ash (*Fraxinus pennsylvanica* var. *subintegerrima* and *F. nigra*), blue beech (*Carpinus caroliniana*), and one hop hornbeam (*Ostrya virginiana*) (in G–5).

Identification of some of the oaks is difficult, because of the presence of hybrids. One example is an oak tree growing on the west bank of West Branch. The bark and growth habit resemble those of swamp white oak (*Quercus bicolor*) (O. A. Alderman, personal communication, 1966), but the leaves look most like those of post oak (*Q. stellata*), and the acorns have the characteristics of those of bur oak (*Q. macrocarpa*). One less extreme example is an oak which is growing near Woodburn Road at the west edge of the forested area and which has the aspect of pin oak (*Q. palustris*), the leaves and winter buds of black oak (*Q. velutina*), though the inner bark is not orange, and acorns resembling those of red oak (*Q. borealis* var. *maxima*).

There is a dense shrub understory in many parts of this hardwood forest. The species include dogwood (*Cornus* spp.), prickly ash (*Xanthoxylum americanum*), berries (*Rubus* spp.), wild roses (mostly *Rosa palustris*, *R. caroliniana*, and *R. virginiana*, with some hybrids), ninebark (*Physocarpus opulifolius*), and nannyberry (*Viburnum lentago*). St. John's wort (*Hypericum spathulatum*) also grows along the road, as do cattails (*Typha latifolia*). Herbaceous plants present include a stand of Christmas fern (*Polystichum acrostichoides*), scattered ferns (*Dryopteris*), violets, and some sedges and grasses. Skunk cabbage (*Symplocarpus foetidus*) is found in seepage areas and *Iris virginica* on the stream bank.

The existence of a hardwood forest in this site (F–4–8) is puzzling, because swamp forest lies both to the east, as described earlier, and to the west, in Booher's Woods, a swamp forest with many dead elms. A few large seepage areas are present in Booher's Woods, which may explain the existence of swamp forest there. In contrast, soils in the hardwood forest area are firm and better drained than are those either to the east or west of this forest. The presence of this hardwood forest between two areas of swamp forest may be explained, at least in part, by past dredging of West Branch, which lies along the east edge of the hardwood forest. Evidence of this dredging, which must have been done on more than one occasion during the past 50 to 60 years, is still visible in the presence of a raised

ridge parallel to the stream, along the west bank. Perhaps the accumulation of these dredgings, plus their effect on the drainage of the land to the west, may account for the better drainage and the hardwood forest stand found in this area.

### *Shrub Communities*

Shrubs are present throughout many of the forest stands, but they dominate, forming an intermediate community, between the forest (arbor vitae and deciduous) and the meadow (bog and marl) associations. One shrub community, associated with the swamp forest, occurs on the far east side of the state-owned property (D– and C–9 and E–10 and 11). This community is now in a successional stage, probably having begun as a coarse shrub community, followed by a community dominated by American elm. The elms are almost gone now, and only a few silver maples are present; mostly this is an area of brambles and coarse annuals, and it is therefore designated as a shrub tract.

North of Woodburn Road and east of Cedar Run (C– and D–7 and 8) is a shrub community associated with the swamp forest and consisting of poison sumac (*Rhus vernix*), prairie rose (*Rosa setigera*), dogwood (*Cornus* spp.), prickly ash (*Xanthoxylum americanum*), black locust (*Robinia pseudo-acacia*), and hop tree (*Ptelea trifoliata*). Although the last three species named are generally small trees, they are only slightly taller than the speckled alder and poison sumac and are considered to be members of the shrub community here.

The shrub community at the north end of the swamp forest (F–1 and 2) is a veritable jungle of berry briars. Raspberry plants grow all along the path beside West Branch, but seldom bear abundant fruit, probably because of the dense shade.

The most common shrubs found with the arbor vitae association are *Alnus rugosa*, *Cornus alternifolia*, *Rhamnus alnifolia*, and several species of *Salix*, in addition to spicebush, cinquefoil, ninebark, and dwarf birch. The most common shrubs here (D– and E–5 and 6) are willows, birch, and *Rhamnus alnifolia*. A large colony of blackberry, *Rubus allegheniensis*, occurs in E–5, but both blackberries and raspberries are scattered throughout the shrub communities and beyond the arbor vitae into the adjoining swamp forest.

Several species of shrubs occur adjacent to the *Thuja*. One such shrub, the black huckleberry (*Gaylussacia baccata*), grows under the arbor vitae along the association boundaries and is found in isolated arbor vitae clumps in the bog and marl meadows, especially where arbor vitae foliage is sparse and sunlight reaches the ground. This shrub grows on the elevated root areas at the bases of *Thuja* trees. Poison sumac is common on the margins of almost every arbor vitae stand. Spicebush (*Lindera benzoin*), elderberry (*Sambucus canadensis*), and species of *Cornus* also occur along the margins of the arbor vitae association, as well as in most of the forest associations in Cedar Bog. Cinquefoil and dwarf birch grow along the arbor vitae margins, as well as being abundant throughout the bog meadow.

A unique, stable shrub community lies south of Woodburn Road on the west bank of Cedar Run. Here, in a dense herbaceous layer, mostly grasses, which almost conceals the many seepage areas and treacherous sink holes, grow swamp rose (*Rosa palustris*), poison sumac, ninebark (*Physocarpus opulifolius*), *Alnus rugosa*, *Cornus alternifolia*, and several species of *Salix*.

## ANNOTATED PLANT LIST

In the annotated plant list below, the following information is given for each species: frequency and occurrence, whether or not species was reported by Kellerman (Kellerman and Werner, 1893; Kellerman and Wilcox, 1895), whether or not this constitutes a new record for the species, either in Cedar Bog or in the whole county, and observed flowering time. The frequency of a species is designated

by one of the following terms: rare, occasional, frequent, common, or abundant, use of which terms were my judgments, based on how often a particular species was observed throughout the Bog. The occurrence of a species or of a collection is noted by reference either to the quadrat system indicated in figure 1 and or to the plant associations in which the species were found (Frederick, 1967).

Those species also reported by Kellerman (Kellerman and Werner, 1893; Kellerman and Wilcox, 1895) are indicated by a symbol following each species name. Of the species listed in these two publications, not all are supported by voucher specimens. Therefore two different symbols are used to identify species reported by him:

Kv—reported by Kellerman and Werner (1893) or by Kellerman and Wilcox (1895), and with voucher specimens in The Ohio State University Herbarium, and

Kn—reported by Kellerman and Werner (1893) or by Kellerman and Wilcox (1895), but with no voucher specimens in The Ohio State University Herbarium.

Two other symbols are also used in this list to identify:

UB—previously unreported from Cedar Bog, but collected from other areas of Champaign County, and

UC—previously unreported from Champaign County, Ohio.

To identify those species previously reported either from Cedar Bog or from Champaign County, information was drawn both from the literature and from herbarium specimens. Publications consulted were Braun (1961 and 1967), Dachnowski (1912), Franks (1931), Stuckey (1966), and Hicks (undated), in addition to the Kellerman lists (Kellerman and Werner, 1893; Kellerman and Wilcox, 1895). Most herbarium specimens studied were in The Ohio State University Herbarium; no comprehensive attempt was made to search for Kellerman, Werner, or Wilcox specimens in other herbaria. Two other botanists, B. Jane Spence and W. J. Biddlecombe, both of Springfield, Ohio, also collected plants in Cedar Bog, working prior to 1859, and contributed their specimens to The Ohio State University Herbarium.

Also noted in this list are specimens collected in Cedar Bog that are preserved in a small but interesting collection of plants at Urbana College. Most of these specimens were collected in the 1800's by Milo G. Williams, though some were provided by W. S. Sullivant and John Samples. Unless otherwise indicated, however, all herbarium specimens studied were in the Herbarium of The Ohio State University.

Plants in the list generally considered to be boreal species are so indicated. Prairie species commonly considered to originate in prairies are so noted when that information is known, but a clear delineation of prairie species is not now available. A few species appear to be more common on the eastern coastal plain and in the Mississippi embayment, and these are so identified in the list.

The estimated age of trees has been calculated from information given by Fowells (1965). These are purely estimates, based on the average or most common annual increment in diameter of the species described, in order to give a general idea of the age of different forest stands in Cedar Bog.

Nomenclature of all woody plants and monocots follows that of Braun (1961 and 1967); nomenclature of herbaceous flowering plants follows that of Fernald (1950), although additional works, particularly monographs, have also been consulted. Nomenclature of ferns and other pteridophytes follows Wagner (1962, 1963, and 1965), Wherry (1961), and Blasdell (1963).

Voucher specimens for all species given in this list were collected in this study and are deposited in The Ohio State University Herbarium, together with a copy of the quadrat map. Duplicates, where available, are deposited in the herbarium at Urbana College, Urbana, Ohio.

## ACANTHACEAE

*Ruellia strepens* L. UC
Rare. Collected once in I–11.

## ACERACEAE

*Acer negundo* L. Boxelder. Kn
Infrequent in the swamp forest association. In G–10 and small trees in F–3.
*Acer nigrum* Michx. f. Black maple
Only two specimens collected seem typical of the species, based on presence of stipules. Several are intermediate and appear to be hybrids of *A. nigrum* and *A. saccharum*.
*Acer rubrum* L. Red maple
Very common; usually associated with silver maple in moderately wet areas of the swamp forest. One large tree in H–11 measured 40 inches DBH; average annual growth in diameter (Fowells, 1965) indicates this tree may be well over 100 years old.
*Acer saccharinum* L. Silver maple. Kn
The most abundant maple in the Bog. In almost all forest regions of the Bog, especially in wet areas in the center of region north of Wooburn Road and in swamp forest of western extension.
*Acer saccharum* Marsh. Sugar maple
One specimen collected by Kellerman, but no location given. In west end of hardwood forest. Some very large trees in J and I at boundary of 10 and 11. One tree, 30½ inches DBH, is possibly 150 years old (Fowells, 1965). Three specimens appear to be hybrids with *A. nigrum*.

## ALISMATACEAE

*Alisma subcordatum* Pursh. Eastern water plantain. UB
Occasional in F–10 at convergence of streams and in F–8, West Branch, just north of Woodburn Road.
*Alisma trivale* Pursh. Kn
Rare. In F–8 in West Branch just north of Woodburn Road. Flowers, late August.
*Sagittaria latifolia* Willd. Kv
Rare. At edge of West Branch, in F–8.

## AMARYLLIDACEAE

*Hypoxis hirsuta* (L.) Coville. Yellow star grass. Kn
Rare. In D–7 in the arbor vitae association. Flowers, mid-May to early June.

## ANACARDIACEAE

*Rhus radicans* L. Poison ivy. Kn
Not collected. Abundant in swamp forest. Many large fruit-bearing vines.
*Rhus vernix* L. Poison sumac. Kn
Common along Cedar Run both north and south of Woodburn Road. Not collected.

## APOCYNACEAE

*Apocynum cannabinum* L. UC
Observed only once, in E–9.
*Apocynum sibiricum* Jacq. Indian hemp. UC
Occasional. In E–9 on roadside west of east bridge.
*Vinca minor* L. Myrtle. UC
Probably adventive; in the hardwood forest association of the Bog. Occasional. In J–11.

## AQUIFOLIACEAE

*Ilex verticillata* (L.) Gray. Winterberry. Kn
Rare in shrub zones around marl meadow areas, E–6.

## ARACEAE

*Arisaema atrorubens* (Ait.) Blume. Jack-in-the-pulpit
Abundant in all swamp forest associations, as well as in many arbor vitae stands. Sometimes the only herbaceous plant in young dense arbor vitae areas. Flowers, May.
*Arisaema dracontium* (L.) Schott. Green dragon
Rare. Found only in one place, F–4. Flowers, mid-June.
*Symplocarpus foetidus* (L.) Nutt. Skunk cabbage
Abundant. On roadsides; in all wet areas of swamp forest and arbor vitae associations. In E– and F–8 and 9. Flowers, March and April.

## ARALIACEAE

*Aralia racemosa* L. Spikenard. Kn
Common in arbor vitae association, D–7, and in swamp forest, F–10 and 11. Flowers, mid-June.

## ARISTOLOCHIACEAE

*Asarum canadense* L. Wild ginger. UB

Frequent in hardwood forest in western extension. Also common in woods elsewhere throughout the county.

*Hexastylis virginica* (L.) Small ?

Identification not certain because the plant has not been seen in flower. This species was planted in Cedar Bog by Carl Horst of Dayton, as confirmed to me by Mr. Horst (personal communication, 1966). One plant in arbor vitae stand, E–8.

## ASCLEPIADACEAE

*Asclepias exaltata* L. UC

Observed only once, G–8.

*Asclepias incarnata* L. Swamp milkweed. Kn

In bog meadow and arbor vitae associations. Frequent. Flowers, mid-July to early August.

There are two distinctly different subspecies in Cedar Bog, but neither completely fits Woodson's subspecies (Woodson, 1954). Specimens #1144 (D–8) and #207 (E–9) are somewhat like *A. incarnata* L. subsp. *incarnata*, but are conspicuously pubescent. Stems repeatedly branched. Leaves leathery with truncate bases. Specimens #525 (D–6) and #552 (D–7) are most nearly like subsp. *pulchra*. Unbranched (#552) or a single branch. Corollas completely purplish (#525) or pinkish purple with cream at very base (#552). Leaves thin, not leathery.

Woodson (1954) considers var. *pulchra* as "adventive in Ohio, . . . watersides and moist soil, frequently in somewhat brackish tidal marshes." The alkaline soil in Cedar Bog and the water heavily charged with calcium carbonate would provide a somewhat similar habitat.

*Asclepias syriaca* L. Common milkweed. Kn

Occasional along roadsides through the Bog in sunny areas. Flowers, July.

## BALSAMINACEAE

*Impatiens capensis* Meerb. Spotted touch-me-not

Abundant throughout all the swamp forest.

*Impatiens pallida* Nutt. Pale touch-me-not

Common in only one area, G–11. Reported by Hicks, but no specimen from Champaign County.

## BERBERIDACEAE

*Berberis thunbergii* DC. Japanese barberry. UB

An adventive. Rare, in F–7.

*Caulophyllum thalictroides* (L.) Michx. Blue cohosh

Frequent in swamp forest associations of Cedar Bog and occasional in hardwood forest. Flowers, late April.

*Podophyllum peltatum* L. May apple

Common in young maple stand, F–9, south of Woodburn Road, and in western extension hardwood forest.

## CAMPANULACEAE

*Campanula americana* L. Tall bellflower

Common on roadsides, E–8 and F–8. Flowers, August. Specimen #1237 appears to be *C. americana* L. var. *illinoensis* (Fresn.) Farw. Collected once in arbor vitae stand, E–10. Leaves are broadly ovate, not long tapering as is characteristic in the species, and petioles are distinct, not winged.

*Campanula aparinoides* Pursh. Kv

Abundant throughout bog meadow. Flowers, mid-July through September. Boreal species.

*Lobelia kalmii* L. Kv

Abundant in bog meadow. Flowers, August and September. Relict boreal species.

*Lobelia puberula* Michx. Downy lobelia. UC

Specimens #172, #615, and #987, all found in D–6, most closely resemble this species. Specimen #1247 from E–9 may be a hybrid of this species with *L. siphilitica*; sepals are auricled, but plant is pubescent. Flowers, late August and September.

*Lobelia siphilitica* L. Great blue lobelia. Kn

Common in arbor vitae and swamp forest associations.

Great variation exists in this species in Cedar Bog: corolla may be deep blue,definitely lavender with no blue color, or blue with conspicuous white protuberance and lip; leaves may be petiolate or not, glabrous to even hirsute. These plants may be examples of introgressive hybridization between *L. puberula* and *L. siphilitica* in a disturbed habitat. Practically every specimen collected has some characteristics of both species. Flowers, late August and September.

CANNABINACEAE

*Humulus lupulus* L. Common hop. Kn
Occasional, in swamp forest, E–4 and 5. Also in E–9.

CAPRIFOLIACEAE

*Lonicera dioica* L. Honeysuckle. Kn
Occasional in F–4, 6, and 8, in the swamp forest association. The specimens from Cedar Bog are atypical and grade toward *L. prolifera* (Kirchn.) Rehd. or *L. flavida* Cockerell, the latter reported as a possible hybrid between *L. dioica* and *L. prolifera* (Braun, 1961). *L. prolifera* has been collected in Champaign County, but not *L. dioica*.
*Lonicera maackii* Maxim. UC
Occasional in J–11 and I–11.
*Sambucus canadensis* L. Elderberry. Kn
Common in swamp forest north of Woodburn Road; occasional along roadside, south.
*Viburnum lentago* L. Nannyberry. Kv
Frequent in swamp forest and hardwood forest associations, E– and F–9; also in J–10. Flowers, mid-June.
*Viburnum prunifolium* L. Blackhaw. UB
In deciduous forest, J–10. Flowers, late May.

CARYOPHYLLACEAE

*Saponaria officinalis* L. Bouncing bet. UC
Along roadsides, E–8 and 9; also in F–9. Flowers, July.

CELASTRACEAE

*Euonymus atropurpureus* Jacq. Wahoo bush. Kn
Occasional on the banks of West Branch, F–4 and 6, and in the swamp forest, E–6 and 8. Also, rarely in western extension, I–11.
*Euonymus obovatus* Nutt. Running strawberry bush
Infrequent on stream bank, F–6, and frequent in deciduous forest, I–11.
*Celastrus scandens* L. Bittersweet
Never observed in flower in Cedar Bog proper, probably as a result of dense shade. In fence rows east of the Bog, it both flowers and fruits. Occasional in swamp forests, F–6 and G–11.

CHENOPODIACEAE

*Chenopodium hybridum* L. Goosefoot. UC
A common weed throughout the area. In F–8.

COMPOSITAE

*Actinomeris alternifolius* (L.) Britt. Wingstem. Kn
Reported by Kellerman as *Verbesina*. Very common along roadside and along West Branch. Flowers, August.
*Ambrosia artemisiifolia* L. Roman ragweed. Kn
Frequent on roadsides.
*Ambrosia trifida* L. Greater ragweed. Kn
Very common on roadsides, especially in sunny, wet areas.
*Arctium minus* (Hill) Bernh. Burdock
In semishaded areas, F–8, 9, and 10. Frequent.
*Aster* spp.
Frequently intergrading specimens are found and some hybridization has probably occurred. With one exception, Speer (1958) is followed here.
A majority of the asters listed here have not been reported from Champaign County. Doubtless this is due to the small number of collections made in the county.
*Aster cordifolius* L.
Infrequent in E–9 and J–11. Flowers in September.
*Aster dumosus* L. UC
Frequent in shade of swamp forest and arbor vitae associations, F–9, and E–5 and 9. Three specimens assigned to this species, #626, #643, and #1267, may be hybrids. They were collected during the last week of August and the first week of September, whereas all the others were collected in October.
*Aster junciformis* Rydb. UC
Frequent. Found only in the bog meadow, D–6 and 7, and E–9.
Previously collected in only a few northeastern counties of Ohio. Possibly this species should be reduced to a variety of *A. puniceus*, but, following Speer (1958), is retained as a separate species here. The foliage is distinctly different from *A. puniceus*. Flowers, September. Boreal species.
*Aster laevis* L. Smooth aster. UB
Occasional in bog meadow, F–9, and on stream bank, E–9. Flowers, late September and October.

*Aster lateriflorus* (L.) Britt. Kv
Common in bog meadow, secondary swamp forest, F–9, and even in open areas in arbor vitae association, but always in wet situations. Flowers, late August into October.
*Aster lowrieanus* Porter. UC
Rare in bog meadow, D–8. Flowers, late September.
*Aster novae-angliae* L. New England aster. Kn
Common in bog meadow, E–9 and F–9. Flowers, early September.
*Aster pilosus* Willd. Kn
Only one plant observed, on bank of West Branch, north of Woodburn Road. Reported by Kellerman as *A. ericoides pilosus* (Willd.) Porter. Flowers, early October.
*Aster prenanthoides* Muhl. Kn
In arbor vitae stands west of Cedar Run, D–7 and in bog meadow, D–8. Flowers, late September and early October.
*Aster puniceus* L. Kv
Abundant in bog meadow areas, D–6, 7, and 8 and also in arbor vitae, E–7 and 9. Flowers, mid-to late September.
*Aster puniceus* L. var. *lucidulus* (Gray) Fern. UC
Occasional in the bog meadow, E–9 and D–8. This variety is not recognized by Speer, but it seems to be distinctive. Flowers, late September.
*Aster simplex* Willd. var. *interior* (Wieg.) Cronq.
Occasional in arbor vitae association, E–8 and 9. Flowers, late September, early October.
*Aster simplex* Willd. var. *ramosissimus* (T. & G.) Cronq. UC
Occasional in marl meadow, D–6 and E–6. Flowers, September and October.
*Aster simplex* Willd. var. *simplex*. Kv
Frequent in swamp forest and arbor vitae associations; D–5 and 8, F–7 and 10, and G–10. Flowers, September and October.
*Aster umbellatus* Mill. Kv
Frequent at edge of arbor vitae stands, E–9, D–9 and D–5, and in swamp forest, F–10. Flowers, September and early October.
*Bidens aristosa* (Michx.) Britt. Kv
In bog meadow, D–6 and E–9. Flowers, September.
*Bidens cernua* L.
Occasional in stream margin, West Branch, F–8. Flowers, early September.
*Bidens connata* Muhl. UC
Common. Aquatic in West Branch, F–7 and 9. Flowers, late August and early September.
*Bidens coronata* (L.) Britt. Kn
Occasional in marl meadow, D–4 and 7. Reported by Kellerman as *B. trichosperma* (Michx.) Britt. One specimen collected in E–9 is probably var. *tenuiloba* (Gray) Sherff. or an extreme ecotype of *B. aristosa*. Flowers, late September.
*Bidens, laevis* (L.) BSP. Kv
Only one specimen collected, in F–5 along West Branch, and this is not typical. The plant looks very similar to *B. cernua*, but the chaff is red-tipped, so the specimen is thus judged to be *B. laevis*, or a hybrid of that species. Flowers, mid-September.
*Cacalia suaveolens* L. Kn
Rare. In swamp forest zone, F–4. Flowers, October.
*Cacalia tuberosa* Nutt. Indian plantain. Kv
Common in the bog meadow regions, D–6 and 8, E–9. Flowers, July and August.
*Cichorium intybus* L. Chicory. UC
Frequent along roadsides. Flowers, July.
*Cirsium muticum* Michx. Swamp thistle. Kn
Common in bog meadow and at margin of arbor vitae stands, D–6 and 7, and E–4. Flowers, August.
*Cirsium vulgare* (Savi.) Tenore. Bull thistle. Kn
In drier areas east side of Bog, D–7 and 8, along roadside, E–9, and at deciduous forest margin, J–12. Flowers, early September.
*Coreopsis tripteris* L. UC
Common in marl and bog meadows, D–5 and 6, and E–5. Flowers, August.
*Erechtites hieracifolia* (L.) Raf. Kn
Rare in roadside ditch, F–8. Specimen collected is var. *intermedia* Fern. Flowers, late August.
*Erigeron annuus* (L.) Pers. Kn
Occasional on roadsides, D–7 and E–8, and at margins of deciduous forest in field, J–10. Flowers, July to early August.
*Erigeron philadelphicus* L. UB
Frequent along path beside West Branch. Flowers, May and June.
*Erigeron strigosus* Muhl. Daisy fleabane. Kn
Reported as *E. ramosus* (Walt.) BSP by Kellerman. Occasional along west path, F–7 and 8, and on east side in swamp forest, D–8. Flowers, July and August.
*Eupatorium fistulosum* Barrett. UC
Rare. East side of Bog, C–8. Flowers, late August.

*Eupatorium maculatum* L. Spotted Joe-pye-weed
Occasional in drier areas on far east side of Bog, D–7, and on roadside, F–8. Not previously collected from Cedar Bog, although reported by Hicks (undated). Flowers, late August.
*Eupatorium perfoliatum* L. Common boneset. Kn
Occasional in bog meadow, D–7. Flowers, late August and early September.
*Eupatorium purpureum* L. Joe-pye-weed. Kn
Occasional, in marl meadow, D–6. Flowers, early August.
*Eupatorium rugosum* Houtt. White snakeroot. Kn
Abundant in swamp forest, D–7, E–9, and F–10 from north end of Bog south to Woodburn Road. Reported by Kellerman as *E. ageratoides* L. Flowers, September to early October.
*Galinsoga ciliata* (Raf.) Blake. UC
Along roadside, E–9.
*Helenium autumnale* L. Sneezeweed
Common in the bog meadow and marl meadow associations. Not recorded in Kellerman's publications, although a specimen was collected by him in 1894. Flowers, late August and throughout September.
*Helianthus* spp.
The majority of sunflower species listed here can be considered prairie species, introduced into the area during the Xerothermic period.
*Helianthus decapetalaus* L. UC
Observed only once, in F–8.
*Helianthus giganteus* L. Kv
Common in bog meadow, D–5, 7, 8, and 9, and E–7, 8, and 9, as well as in swamp forest, F–10. Flowers, late August and early September.
*Helianthus grosseserratus* Martens. UC
Frequent in drier areas of swamp forest, E–4 and 9, and F–8. Flowers, July to September.
*Helianthus hirsutus* Raf. UC
Occasional in bog meadow, D–9, E–9, and F–11. Flowers, late August and early September.
*Helianthus maximiliani* Schrad.
Rare. Collected only in E–9. Flowers, early September. Prairie species (Slife *et al.*, 1960).
*Helianthus strumosus* L. UC
Observed only once, H–9.
*Heliopsis helianthoides* (L.) Sweet. Oxeye. Kn
Common along the path paralleling the West Branch, F–6, 7, and 8. Flowers, July and August. Possibly a prairie species.
*Krigia biflora* (Walt.) Blake. UC
Common, bog meadows, D–5 and 7, and E–9. Flowers, May.
*Lactuca biennis* (Moench.) Fern. UC
Found only once in deciduous forest, western extension, H–10. Flowers, October.
*Lactuca canadensis* L. var. *latifolia* Ktze. Wild lettuce. Kv
Occasional on roadsides. Werner's specimen is annotated var. *longifolia* (Michx.) Farw. Flowers, mid-July to mid-August.
*Lactuca scariola* L. Kv
Found only once near east bridge on roadside, E–9. Flowers, mid-August.
*Liatris spicata* (L.) Willd. Blazing star. Kv
Common in bog meadow north of Woodburn Road, D–4 and 6, and E–4. Reported by Kellerman as *Lacinaria spicata* (L.) Kuntze. Flowers, mid-July through August. Relict prairie species (Braun, 1928).
*Polymnia canadensis* L. Clammy leafcup. Kv
Abundant throughout swamp forest. Begins flowering in late July and continues until first hard freeze, usually in late October.
*Prenanthes altissima* L.
Occasional in arbor vitae stand, E–9, south of Woodburn Road. Unreported by Kellerman, although he collected a specimen in 1894, labeled *Nabalus altissimus* Hook. Flowers, mid-September.
*Prenanthes racemosa* Michx.
Frequent in bog meadow D–5 and 7, and along Cedar Run, D–7. Kellerman did not report his own specimen collected in 1894, labeled *Nabalus racemosa* Hook. Flowers, September.
*Rudbeckia hirta* L. Black-eyed susan. Kv
(Including *R. serotina* Nutt.)
Combination of these two as one species is based on an unpublished study of the rudbeckias in Ohio by Frederick in 1964. There are only small morphological differences among specimens collected in Ohio.
Common in the bog meadow, D–5 and 6, and F–11. Flowers from late June until near the end of August. Prairie species (Slife *et al.*, 1960).

*Rudbeckia fulgida* Ait. Kv

(Including *R. speciosa* Wend. and its varieties; *R. tenax* Boynt. & Bead.)

Occasional at margins of arbor vitae stands in D–7 and 8. *Rudbeckia speciosa* and *R. tenax* are included in *R. fulgida*, based on morphological similarity. One distinct variety is recognized below. Kellerman's specimen labeled *Heliopsis helianthoides* has been properly identified as a *Rudbeckia*. Flowers, early August.

*Rudbeckia fulgida* Ait. var. *umbrosa* (Boynt. & Bead) Cronq. UC

The most common taxon of this species. In the marl and bog meadow associations, D–5 and 8, and E–6. Flowers, August.

*Rudbeckia laciniata* L. Kn

Common along the path beside West Branch, F–6, 7, 8, and 10, and also in D–7. Flowers mid- to late August. Prairie species (Slife *et al.*, 1960).

*Senecio aureus* L. Golden ragwort. Kn

Abundant in swamp forest, E–8, and F–6, 7, and 8. Flowers, May to mid-June.

*Senecio aureus* X. ? UC

One specimen (#106) has no basal tuft of leaves at anthesis. Three-pinnate leaves, near base of stem; lobes distant, deeply serrate, not rounded as in *S. aureus*. Blooms mid-June. Could be an ecotype of *S. aureus*.

*Silphium terebinthinaceum* Jacq. Prairie dock. Kn

Abundant at margins of arbor vitae stands and bog meadow along Cedar Run, both north and south of Woodburn Road. Flowers, late July through August. Prairie species (Braun, 1928).

*Silphium trifoliatum* L.

Occasional in bog meadow and marl meadow associations, D–5, 6, and 7, and E–5 and 6. Not recorded by Kellerman, but there is a specimen collected by Kellerman in 1894, as well as one collected by Werner in 1893. Flowers, late July and early August.

*Solidago* spp.

Despite the fact that there are many species of *Solidago* growing in the Cedar Bog area, no evidence of hybridization or intergradation exists between species.

*Solidago altissima* L. UC

Rare at edge of swamp forest, F–9. Flowers, October.

*Solidago bicolor* L.

Only one specimen collected at arbor vitae-swamp forest margin, F–9. Flowers, early October. Dr. T. R. Fisher noted that this specimen is not typical of the species (personal communication, 1966).

*Solidago caesia* L. Blue-stem goldenrod

Observed only one, F–9. Reported by Hicks (undated).

*Solidago canadensis* L. Kn

Common along margins of both the swamp forest and bog meadow, E–8 and 9, and F–8, in somewhat drier areas. Flowers late August to mid-September.

*Solidago erecta* Pursh. UC

Common in the marl and bog meadow, D–6 and 7, and E–9. Flowers, mid-September to mid-October. May be a prairie species.

*Solidago flexicaulis* L.

Found only once near West Branch, F–5. Flowers, mid-October.

*Solidago hispida* Muhl. UC

Observed at only one location, in field, J–10 and 11.

*Solidago nemoralis* Ait.

Occasional along path beside West Branch, F–6 and 8. Flowers, mid-September to mid-October.

*Solidago ohioensis* Riddell. Ohio goldenrod. Kv

Abundant in bog meadow, E–5, 6, and 9; E–8 and 9; and F–11. Begins flowering in July and continues until killing freeze in October.

*Solidago patula* Muhl. Kv

Only one rather poor specimen collected, E–9, south bog meadow. Dr. Clara Weishaupt also collected a specimen from Cedar Bog October, 1960. Flowers, late August through September.

*Solidago riddellii* Frank. Kn

Common in bog meadows, D–8 and 9, and E–9. Flowers, mid-September until killing freeze.

*Solidago rugosa* Mill. var. *rugosa*. Kv

Common in bog meadow, E–9 and D–7. Flowers, late August and early September.

*Solidago rugosa* Mill. var. *aspera* (Ait.) Fern. UC

One specimen, #650, collected September 8, 1964, in marl meadow, D–5.

*Solidago speciosa* Nutt. UB

Collected only once in late September in E–8 among arbor vitae east of Cedar Run.

*Solidago uliginosa* Nutt. Bog goldenrod

Common in bog meadow, D–5 and 6, E–9, and F–9. Flowers, late August to late September.

*Solidago ulmifolia* Muhl. UC
Common in bog meadows, D-6, 8, and 9. Flowers, late September to mid-October.
*Sonchus asper* (L.) Hill. Sow thistle
Common along road through Bog.
*Taraxacum officinale* Weber. Dandelion. Kn
On roadsides and occasional in bog meadow.
*Tragopogon pratensis* L. Goat's-beard
Found only once on roadside west of swamp forest.
*Vernonia altissima* Nutt. Ironweed. Kn
Most of the ironweeds in Cedar Bog are found on the east side, actually not on state-owned property, in C– and D-6, 7, and 8. A few are found in the open areas in H–7, F–11, and G–10. This species is by far the most common and is very colorful in late August and early September. Prairie species (Slife *et al.*, 1960).
*Vernonia fasciculata* Michx. UC
Only one specimen out of a dozen ironweed inflorescences, collected (#882) on August 28, 1965, from the quadrats east of the Bog, was of this species, but it has relatively typical flowers.
*Vernonia altissima* x *fasciculata*. UC
In the collection mentioned above (#882) is one specimen that is an intermediate between the two species, suggesting an $F_1$ hybrid. Another specimen also suggests this hybrid, but seems somewhat more similar to *V. altissima*. These specimens may represent another example of introgressive hybridization.

## CONVOLVULACEAE

*Convolvulus sepium* L. var. *sepium* L.
Common along roadsides in sunny areas. This is the most common variety in Cedar Bog.
*Convolvulus sepium* L. var. *fraterniflorus* Mackenz. & Bush. UC
Occasional.
*Convolvulus sepium* L. var. *repens* (L.) Gray.
On roadside near east bridge, E–9.
*Cuscuta gronovii* Willd. Dodder. Kv
Found once growing on *Impatiens capensis* Meerb. August.
*Ipomoea purpurea* (L.) Roth. UC
Along south side of Woodburn Road in swamp forest, F–9. Flowers, mid-August.

## CORNACEAE

*Cornus alternifolia* L. Pagoda dogwood. Kv
The most common dogwood in the Bog. Along roadsides and in swamp forest; occasional along margin of bog meadow and in shrub communities. Flowers, late May. Probably a boreal species.
*Cornus amomum* Mill. Kn
A hybrid, *C. amomum* x *obliqua*, has been collected in Logan County. This specimen is not typical and may be a hybrid rather than true *C. amomum*. Specimen #88 collected in F–8.
*Cornus* X *arnoldiana* Rehd. (*C. obliqua* x *racemosa*)
First collected in Cedar Bog by McFarland in 1937 (specimen in The Ohio State University Herbarium). My collection from E-4 in swamp forest, near West Branch. Specimen #574.
*Cornus drummondi* Meyer. Roughleaf dogwood. Kv
Occasional, in hardwood forest, H–10 and I–11. Werner's specimen, collected in 1892, is labeled *C. asperifolia* Michx.
*Cornus florida L.* Flowering dogwood
One tree in F–12. Flowers, early May.
*Cornus obliqua* Raf. Silky dogwood. Kv
Common in swamp forest, especially along west path, and also beside West Branch south of the road. F–8 and 9. Kellerman's specimen, collected in 1893, was labeled *C. amonum* (sic), but this species is not listed in Kellerman's publications.
*Cornus racemosa* Lam. Gray dogwood
Occasional in swamp forest, E–7.
*Cornus stolonifera* Michx. Red-osier dogwood. Kn
Occasional in shrub communities south of road, E–9 and also in D–4 and F–5. Specimens are typical of this species with white pith and red branchlets. Flowers, June. Relict boreal species.

## CORYLACEAE

*Alnus rugosa* (Du Roi) Spreng. Speckled alder. Kn
Common throughout the wet shrub communities, E–6 and 9 and F–10. Boreal species. One specimen, #804, appears to be var. *americana* (Regel) Fern.
*Betula pumila* L. Swamp or dwarf birch. Kv
Abundant throughout all parts of the bog meadow. Generally considered to be a northern bog shrub (Braun, 1961), with Cedar Bog the southernmost extension of the species. Known also under the names of *B. glandulifera* Butter and *B. pumila* L. var. *glandulifera*.

*Carpinus caroliniana* Walt. Ironwood, musclewood, blue beech
Abundant in all swamp forest areas as a subcanopy small tree.
*Corylus americana* Walt. Hazelnut. Kn
Abundant in wet portions of swamp forest north of Woodburn Road, E- and F-7 and 8. Occasional in E-6 and 9.
*Ostrya virginiana* (Mill.) K. Koch Hop hornbeam. UC
Noted only once. Relatively large tree, F-6, in oak-maple forest west of West Branch.

## CRUCIFERAE

*Alliaria officinalis* Andrz. Garlic mustard
Abundant in all swamp forest association areas. Common in hardwood forests. Flowers, early May.
*Brassica kaber* (DC) L. C. Wheeler. UC
In F-8, on north side of Woodburn Road, near west edge of Cedar Bog.
*Cardamine bulbosa* (Schreb.) BSP. Spring cress
Common in all swamp forest areas; abundant in D-7, and E-6 and 8. Flowers, May.
*Cardamine douglassii* (Torr.) Britt. Purple bittercress
Frequent in hardwood forest, E-8, F-9, and G-10. Flowers, late April and early May.
*Lepidium campestre* (L.) R. Br. UB
On roadsides, E- and F-8 and 9.
*Nasturtium officinale* R. Br. Watercress. Kv
Abundant in West Branch. Kellerman's specimen, 1894, is labeled *Rorippa nasturtium* (L.) Rusby. Remains green throughout the entire year. Flowers, May.
*Rorippa palustris* (L.) Bess. var. *farnaldiana*. (Butt. & Able) Stuckey. UB
Observed one plant, growing with *R. sylvestris*, in H- and I-8.
*Rorippa sylvestris* (L.) Bess. UC
Observed only once, H- and I-8, in standing water.

## CUCURBITACEAE

*Echinocystis lobata* (Michx.) T. & G. Wild balsam apple. Kn
One specimen, G-11. Reported as *Micrampelis lobata* (Michx.) Greene by Kellerman. Flowers, mid-August.

## CYPERACEAE

*Carex annectens* Bickn. UC
Collected in fruit once along roadside, E-9. This area is usually mowed several times during the growing season. One collection indicates only that it was not seen in fruit at any other time. Plants are common.
*Carex bromoides* Schkuhr.
Frequent in open areas in swamp forest, E-4 and I-11. Not reported by Kellerman, but specimen collected by Werner, 1893.
*Carex buxbaumii* Wahlenb.
Frequent in marl and bog meadows, D-7 and E-5. Not reported by Kellerman, but Werner's specimen, 1893, is extant.
*Carex cephalantha* (Bailey) Bickn. UC
Collected once in E-5.
*Carex cryptolepsis* Mackenz. UC
Observed only once, in E-8.
*Carex flava* Mackenzie var. *flava*
Frequent in marl meadow, D-6 and E-8. Not reported by Kellerman, but specimen exists, collected by Werner, 1893. Also a specimen at Urbana College, collected by W. S. Sullivant.
*Carex flava* Mackenzie var. *fertilis* Peck. UC
Common in marl meadows, D-5 and 6, and E-5.
*Carex gracillima* Schwein.
Occasional in bog meadow, E- and F-9. Not reported by Kellerman, but Werner's specimen, 1893, is extant. Boreal species.
*Carex grayii* Carey. Kv
Collected once in deciduous forest, J-11. Reported as *C. Asa-Grayi* Bailey, by Kellerman; Werner specimen, 1893, also labeled *C. Asa-Grayi*.
*Carex hyalinolepis* Steud.
Collected once on north side of Woodburn Road, in arbor vitae stand, E-8. May be more common, but fruiting specimens were unavailable as a result of roadside mowing. Unreported by Kellerman, probably because Werner's specimen of this species was originally labeled *C. lacustris*.
*Carex interior* Bailey. UC
Occasional in bog and marl meadows, D-6 and E-9.
*Carex lacustris* Willd. UC
Collected once in marl meadow, D-7. Reported by Kellerman, but specimen identified as *C. hyalinolepis;* thus this species unreported from Champaign County.
*Carex lanuginosa* Michx. UB
Occasional, marl meadow, E-5.

*Carex laxiflora* Lam. UC
Observed once in marl meadow, D–6. Relict boreal species.
*Carex lurida* Wahlenb. UC
Observed once, D–6.
*Carex pensylvanica* Lam.
Occasional in arbor vitae association, D–6 and 7, and E–9.
*Carex radiata* (Wahlenb.) Dew. UC
Observed once in the bog meadow, E–9, but specimen is young and identification is not certain.
*Carex rosea* Schkuhr. UC
Observed once in hardwood forest, J–10.
*Carex scabrata* Schwein. UC
Frequent in bog and marl meadow, D–6 and E–9.
*Carex sterilis* Willd. Kv
Occasional, in marl meadow, D–6. Reported by Kellerman as *C. sterilis excelsior* Bailey.
*Carex stipata* Muhl. UB
Frequent in bog and marl meadows, E–4 and 5, and F–8.
*Cladium mariscoides* (Muhl.) Torry. Kv
Common in marl meadow, D–5, 6, 7, and 8. Specimen also present at Urbana College, collected by William S. Sullivant, no date.
*Cyperus strigosus* L.
Common in marl meadow, D–5 and 8.
*Eleocharis erythropoda* Steud. (*E. calva* Torr.)
Frequent in marl meadow, D–8.
*Eleocharis palustris* (L.) R. & S. (*E. calva* Torr. by Brown, 1967). UB
There is some question about the identification of this specimen, #97, from E–4.
*Eleocharis pauciflora* (Lightf.) Link
Abundant in pools in marl meadow, D–6. A boreal species (Braun, 1967).
*Eleocharis rostellata* Torr.
Abundant in marl meadow, E–3, 6, and 8, H–9. Forms solid mats and apparently reproduces primarily by rooting of the tips of the vegetative culms (La Rue, 1935). Not reported by Kellerman, but Werner specimen, 1892, labeled *E. palustris*, has been determined to be *E. rostellata*.
*Eriophorum viridi-carinatum* (Engelm.) Fern. Cotton sedge
Occasional in bog meadow, D–6. Relict boreal species.
*Rhynchospora alba* (L.) Vahl. Kv
Abundant in bog meadow, D–6 and E–9. Specimen at Urbana College may have been collected by Milo G. Williams, no date. Boreal species.
*Rhynchospora capillacea* Torr. Kv
Common in wet marl seepage areas, E–6, 7, and 8, and E–9. Boreal species.
*Scirpus acutus* Muhl. Hard-stem bulrush. UC
Observed only once in the marl meadow, D–6.
*Scirpus americanus* Pers.
Frequent in bog meadow, D–6 and 8, and E–4.
*Scirpus atrovirens* Willd. Great river bulrush. UB
Common in D–7, E–8 and 9, and F–8 and 9.
*Scirpus fluviatilis* (Torr.) Gray. UB
Observed once in D–8.
*Scirpus validus* Vahl. Great bulrush
Frequent in bog meadows, D–6 and 8, and E–9.
*Scleria verticillata* Muhl. Kv
Occasional in marl meadow, D–6.

## DIOSCOREACEAE

*Dioscorea villosa* L. Wild yam. Kv
Abundant in swamp forest association.

## DROSERACEAE

*Drosera rotundifolia* L. Round-leaf sundew. Kn
Abundant on hummocks in marl meadow, D–4, 5, 6, and 7. One colony in arbor vitae stand, E–9. Relict boreal species.

## EQUISETACEAE

*Equisetum arvense* L. Field horsetail. UB
Common in arbor vitae stands.
*Equisetum hyemale* L. var. *intermedium* A. A. Eat. UC
One observed in bog meadow, E–9.

## ERICACEAE

*Gaultheria procumbens* L. Wintergreen

Planted in Cedar Bog, E–9, by Carl Horst of Dayton (C. Horst, personal communication, 1966).

*Gaylussacia baccata* (Want.) K. Koch. Black huckleberry

Frequent in arbor vitae stands, D–4 and 6, and occasional in E–9. Not reported by Kellerman, but specimen collected by B. Jane Spence from Cedar Bog in 1879 is labeled *G. resinosa* T. & G. Two specimens at Urbana College are labeled *Vaccinium dumosum* Curt.-Cand. (sic).

## EUPHORBIACEAE

*Euphorbia serpyllifolia* Pers. UC

Observed only once in open field, north of Woodburn Road, H–8.

*Euphorbia vermiculata* Raf. UC

Along roadside in sunny dry areas. Occasional.

## FAGACEAE

*Fagus grandifolia* Ehrh. American beech. Kn

Several very large trees in I– and J–10 and 11. The largest measures 33¼ inches DBH, and must be well over 250—possibly as much as 400—years old (Fowells, 1965). Reported by Kellerman as *F. atropunicea* (Marsh.) Sudw.

*Quercus* spp.

The oaks in Cedar Bog are difficult to identify. The majority of the trees are variants that have characteristics of several different species.

Recalling the history of the area, particularly that of the oak-maple segregate (Frederick, 1967), it is not surprising that hybrids are found here—not only among the oaks, but other taxa as well. Stebbins (1950) pointed out that hybrids are most common in changing environments, in "disturbed" areas. Because of manmade environmental changes, hybrids should be expected in some areas of Cedar Bog.

*Quercus bicolor* Willd. Swamp white oak. Kn

Common in swamp forest, oak-hickory, and oak-maple segregates, in F–6, 7, and 8, and in the entire western extension. The most common oak in the Bog; 16 specimens collected were determined to be this species, although not every one was "typical."

*Quercus bicolor* X *muehlenbergii*. UC

Two specimens appear to be *Q. bicolor* hybrids.

Specimen #1399. A young tree ca. 20–25 feet high on west bank of West Branch, F–5. No acorns, probably because tree is too young. Leaves resemble *Q. bicolor* in overall appearance. Stellate hairs on the undersides of leaves, but definitely not densely pubescent. Terminal winter buds acute, not rounded as in *Q. bicolor*.

Specimen #1401, collected in the same general area, F–5, is probably also this hybrid. Overall, it appears to be *Q. bicolor* X *imbricaria*, but because a hybrid between different subgenera is unlikely, I have judged it to be the same as #1399. Leaf margins commonly undulate, not lobed; stellate hairs below, but not densely pubescent. Both stellate and adpressed hairs along the leaf margin visible on upper surface of the leaf. One-year-old twigs gray-brown rather than the reddish-brown characteristic of *Q. bicolor*.

*Quercus borealis* Michx. f. var. *maxima* (Marsh) Ashe. Red oak. Kn

(*Q. rubra* L. of many authors)

Only one tree (actually, four trunks) is unquestionably red oak. The separate boles arise from one large trunk approximately two feet above the soil surface, and measure from 10 to 18 inches DBH each. In F–6.

*Quercus borealis* var. *maxima* X *shumardii*. UC

This hybrid may be represented by two trees, one in F–11 (northeast corner of quadrat), from which were taken two collections (#1508 and #1032), and a second tree in I–11, which yielded a single collection (#1389). The first tree has acorns like *Q. borealis*, but winter buds like *Q. shumardii*, and heavy tufts of hair at vein axes on undersides of leaves. The second has winter buds and acorns similar to *Q. shumardii*, but lacks the heavy tufts of hair at vein axes. Petioles are red.

*Quercus borealis* var. *maxima* X *velutina*. UC

One specimen, #1421, from G–10, appears to be this hybrid.

*Quercus imbricaria* Michx. Shingle oak. UB

One relatively large tree on west bank of West Branch, F–4, and few small ones east of stream, F–4 and 5.

*Quercus macrocarpa* Michx. Bur oak. Kn

Identification of this tree (two specimens, #1445 and 1507) is based on the acorns, about which there should be no question; these acorns are certainly like bur oak acorns. The bark characteristics and growth habit are those of *Q. bicolor* (O. A. Alderman, personal communication); so it may be hybrid of *Q. macrocarpa* and not the species.

*Quercus michauxii* Nutt. (or in *Q. michauxii–Q. montana* Willd. complex). Swamp chestnut oak. UC

(*Q. prinus* L. of many authors)

Four specimens (#324, #1119, #1269, and #1396) belong in this group, no representatives of which have heretofore been reported from Champaign County. Each is from a different area in Cedar Bog. I believe that these are all specimens of *Q. michauxii* Nutt., despite the fact that Braun (1961) does not accept this species as native to Ohio. Both Chadwick and Alderman said "chestnut oak" when looking at these specimens (L. C. Chadwick and O. A. Alderman, personal communications, 1964).

Specimens #1396 (F–3) and #1119 key directly to *Q. michauxii;* #1269 (J–10) and #324 (F–7) key to *Q. montana* in Braun's (1961) key. No acorns were found with any of these specimens, so it is possible that these are all extreme variants of the hybrid *Q. bicolor* and *Q. muehlenbergii.*

*Quercus muehlenbergii* Engelm. Chinquapin or yellow oak. Kn

Frequent west of West Branch in F–3, 4, 7, and 8, and south of Woodburn Road in F–10, I–10 and 11, and J–11. There are 11 specimens which seem to be *Q. muehlenbergii,* although not all are "typical."

*Quercus palustris* Muenchh. Pin oak

Only one specimen, #1400, collected in F–5, seems to be this species.

*Quercus palustris* X *borealis* var. *maxima.* UC

One large tree, in F–8, just north of Woodburn Road apparently represents this hybrid. The growth habit is characteristic of pin oak; twigs are greenish black; winter buds are similar to *Q. palustris,* but acorns, leaves, and bark are more like *Q. borealis* var. *maxima.*

*Quercus shumardii* Buckl. Shumard red oak. UC

Specimens from three trees are most nearly like this species. All are mature trees; all are so similar as to be almost indistinguishable. Acorns have been collected from each tree, so it seems improbable that these are hybrid oaks. The largest tree, 40 inches DBH, is in J–11; another measuring 32 inches DBH in I–12; the third is in G–10. The first two are interpreted to be 100 to 125 years old (Fowells, 1965).

Species originating in the southeast and gulf coastal plain, and in the Mississippi embayment (Fowells, 1965).

*Quercus stellata* Wang. Post oak

This species has been reported from Cedar Bog (Hicks, undated), but no specimens from Champaign County have been recorded (Braun, 1961). Specimen #1009 most nearly resembles this species and was collected in J–10, the oak-hickory segregate of the deciduous forest (Frederick, 1967). Leaves appear to be an extreme variant of *Q. macrocarpa;* acorns are similar to *Q. alba* L. Twigs gathered on October 10, 1965, are densely downy pubescent. When comparing my specimen to herbarium specimens of *Q. macrocarpa,* I noted that a specimen of bur oak collected about two miles north of Cedar Bog (Herrick, July 2, 1957) had sparsely pubescent twigs, though all other bur oak specimens examined were entirely glabrous.

*Quercus velutina,* Lam. is not being reported here. Although several specimens looked like black oak, none showed the characteristic orange inner bark. Therefore, all must be hybrids.

## GENTIANACEAE

*Gentiana andrewsii* Griseb. Bottle gentian. Kv

Occasional on the banks of West Branch, F–8 and 9. Flowers, late September and early October.

*Gentiana crinita* Froel. Fringed gentian. Kv

Abundant in the bog meadow, D–5 and 6. Frequent south of Woodburn Road, E–9. Flowers, late September into November.

## GERANIACEAE

*Geranium maculatum* L. Wild geranium. UC

Common along west path and in swamp forest association. Flowers, late April and May.

## GRAMINEAE

Several grass specimens in The Ohio State University Herbarium were collected by Kellerman and Werner in the early 1890's, but were not reported by Kellerman in his publications.

*Agrostis alba* L. Kn

Occasional in drier section of D–8.

*Andropogon gerardi* Vitman. Giant blue-stem. Kv

Frequent in bog meadow, D–4, and E–9 and 4. Also one colony in opening in arbor vitae stand, F–10. Considered by Tolstead (1942) to be a mesophytic prairie species.

*Andropogon scoparius* Michx. Little bluestem. Kv

Occasional in bog meadow, D–4. With western dune grasses (Tolstead, 1942).

*Bromus ciliatus* L.

Only one specimen, #495, is of this species, collected in D–8. Not reported by Kellerman, but Werner's specimen collected in 1893.

*Bromus latiglumis* (Shear.) Hitchc. UC
Common along west path, F–3, 4, 6, and 7.
*Calamagrostis canadensis* (Michx.) Nutt. UB
Occasional in D–8. Probably a boreal species.
*Cinna arundinacea* L. Wood reed-grass
Common along west path, F–5, 6, and 8; and in open areas of arbor vitae stands, E–8 and 9, and F–10. Not reported by Kellerman, but his specimen was collected in Cedar Bog in 1894.
*Dactylis glomerata* L. Orchard grass. UB
Along roadside and in secondary maple zone, F–9.
*Deschampsia caespitosa* (L.) Breauv. Kv
Frequent in marl and bog meadows, usually on the banks of Cedar Run. In D–6 and 7, and E–9. Specimen at Urbana College and labeled *Aira caespitosa* L. was collected by W. S. Sullivant in "Cedar Swamp near Springfield." Relict boreal species.
*Elymus riparius* Wieg.
Frequent along Woodburn Road, F–8 and 9. Specimen labeled *E. canadensis* L. collected by Kellerman, 1894, but not in his published lists.
*Glyceria striata* (Lam.) Hitchc. Fowl meadow grass. Kn
Frequent in bog meadow zones, E–3 and 9, and also along west path, F–7 and 8. Reported by Kellerman as *Panicularia nervata* (Willd.) Kuntze.
*Hystrix patula* Moench. Bottlebrush grass. UB
Common along west path, F–6, 7, and 8.
*Leersia virginica* Willd. Cutgrass. Kn
Occasional along Cedar Run in openings in arbor vitae stand, F–10. Reported by Kellerman as *Homalocenchrus virginicus* (Willd.) Britt.
*Muhlenbergia glomerata* (Willd.) Trin. Kv
Common in bog meadow, D–8, and E–8 and 9. Reported by Kellerman as *M. racemosa* (Michx.) BSP.
*Muhlenbergia mexicana* (L.) Trin. Kv
Occasional in bog meadow, D–8.
*Muhlenbergia sylvatica* Torr. Dropseed. Kv
Occasional along west path, F–4 and 6.
*Panicum clandestinum* L. UC
Observed once, in F–8.
*Panicum flexile* (Gatt.) Scribn.
Occasional in marl meadow, D–6. Not reported by Kellerman but a specimen collected by him in 1894.
*Panicum lanuginosum* Ell. UC
Occasional among arbor vitae, E–8. A southern and southeastern coastal species.
*Panicum latifolium* L. Kv
Common in bog meadow, D–6 and 8, and E–9. Reported by Kellerman, his specimen labeled *P. macrocarpon* Le Conte.
*Phragmites communis* Trin.
One large stand in bog meadow, E–3.
*Poa palustris* L. UC
Occasional in swamp forest, E–6.
*Poa sylvestris* Gray. UC
Occasional in swamp forest, G–11.
*Setaria viridis* (L.) Beauv. Green foxtail grass
Occasional along roadsides, D–8 and E–9.
*Sorghastrum nutans* (L.) Nash. Indian grass
Abundant in bog meadow, E–9 and D–6. This may be the species Kellerman reported as *Andropogon nutans avenaceus* (Michx.) Hack. There is no specimen to check. Considered a mesophytic grass by Tolstead (1942).
*Sporobolus heterolepis* Gray. Northern dropseed. Kv
Occasional, growing in Cedar Run, E–9, although Fernald (1950) gives distribution as "dry trap, limestone or serpentine . . . rocks and prairies."

## GUTTIFERAE

*Hypericum boreale* (Britt.) Bickn. UC
One location in swamp forest association and shrub communities, D–8. Flowers, early September.
*Hypericum nudiflorum* Michx. UC
Previously unreported in Ohio and identification not yet verified. Found growing in Cedar Run, F–11. A coastal plain species.
*Hypericum punctatum* L. Kn
Common along west path, F–7 and 8. This may be the species reported by Kellerman as *H. maculatum* Walt. but there is no specimen. Flowers, late July into September.

*Hypericum spathulatum* (Spach.) Steud. Shrubby St. John's wort. Kv
Common in roadside ditches and along Cedar Run. Werner's specimen is this species, although labeled *H. performatum* L. Flowers, late July and early August.

## HIPPOCASTANACEAE

*Aesculus glabra* L. Ohio buckeye. UB
Many small trees, J-10 and 11, and I-11. Largest tree observed was only 7½ inches DBH.

## HYDROPHYLLACEAE

*Hydrophyllum appendiculatum* Michx. Waterleaf. UC
Large colony in H-10. Flowers, late May.

## IRIDACEAE

*Iris virginica* L. Blue flag. Kn
Present in two locations, by pool in swamp forest, E-7, and along West Branch, F-6. Kellerman reported *I. versicolor* L., but his plant was probably *I. virginica*.

## JUNCACEAE

*Juncus acuminatus* Michx.
Occasional in marl meadow, D-6 and F-9. Not reported by Kellerman, despite Werner's specimen, collected in 1893.
*Juncus balticus* Willd.
Frequent in marl meadow, D-6 and E-9.
*Juncus brachycephalus* (Engelm.) Buchenau. Kv
Frequent, growing in Cedar Run, E-9, and in marl meadow, D-6 and 7.
*Juncus brevicaudatus* (Engelm.) Fern. UC
Frequent in Cedar Run, E-8, in marl meadow, D-7 and 4, and E-4. Previously unreported in Ohio (Braun, 1967). Relict boreal species.
*Juncus dudleyi* Wieg. UB
Observed once, in marl meadow, D-5.
*Juncus effusus* L. var. *decipiens* Buchenau. UC
Growing in Cedar Run, D-6.
*Juncus nodosus* L. UB
Abundant two locations, growing in Cedar Run, D-6 and E-8.

## JUNCAGINACEAE

*Triglochin maritimum* L. Kn
(*T. maritima* of most authors) Abundant. An aspect dominant in the marl meadow, D-5 and 6, in late April. Reported by Kellerman, but his specimen, 1894, is labeled *T. palustris* L.
*Triglochin palustre* L. UB
(*T. palustris* of most authors)
Frequent, growing in Cedar Run, D-4 and 6, and E-8 and 9.

## JUGLANDACEAE

*Carya glabra* (Mill.) Sweet. Pignut hickory. UC
One specimen from G-11.
*Carya ovalis* (Want.) Sarg. Sweet pignut. UC
Two specimens from I-11 and J-10.
*Carya ovata* (Mill.) K. Koch. Shagbark hickory. Kn
Occasional in F-6, one tree in I-11 measures 25½ inches DBH and is probably ca. 80 years old (Fowells, 1965).
*Carya tomentosa* Nutt. Mockernut hickory. UC
One specimen from G-10.
*Juglans cinerea* L. Butternut. Kn
Common in E-6 and 8, where one large tree is 24 inches DBH; many seedlings in F-4 and 5.
*Juglans nigra* L. Black walnut. UC
Occasional in Cedar Bog. One tree ca. 7 inches DBH and few seedlings in F-6. Large tree on roadside just east of the state-owned property. This species is previously unreported from Champaign County, but surely just overlooked, for it is common throughout the county.

## LABIATAE

*Blephilia hirsuta* (Pursh.) Benth. Kn
Locally abundant in H-11, and I-10 and 11. This may be the species Kellerman reported as *B. ciliata* (L.) Raf.
*Glechoma hederacea* L. Kn
Frequent in arbor vitae stands and swamp forest, F-9 and J-11.
*Lamium purpureum* L. UC
Common in hardwood forest.

*Lycopus americanus* Muhl. Kn
Collected only once, along the path paralleling West Branch, F–4. Flowers, late July.
*Lycopus rubellus* Moench. UC
Frequent in swamp forest, F–7 and 8, and D–7 and 8. Flowers, late August and early September.
*Lycopus uniflorus* Michx. UC
Occasional in arbor vitae zones, D–7 and F–9. Werner's specimen, 1892, labeled *L. virginicus* L., is probably this species. Flowers, mid- to late August.
*Mentha arvensis* L.
Observed once in E–8, in early August.
*Mentha cardiaca* Baker. UC
Observed once in D–8. Bog meadow. Flowers, early August.
*Mentha piperita* L. Kv
Observed once in D–8 in open bog meadow. Flowers, late August.
*Monarda fistulosa* L. var. *mollis* L. Wild bergamot. UB
Occasional, bog meadow, D–8. Also along Cedar Run, south toward Mad River. Flowers, early August.
*Nepeta cataria* L. Catnip. Kn
Observed once in bog meadow, D–8. Flowers, late August.
*Physostegia virginiana* (L.) Benth. False dragonhead, obedience plant. Kn
One large colony at the edge of bog meadow, E–4. Flowers, mid-August.
*Prunella vulgaris* L. Self-heal. Kn
Abundant throughout arbor vitae and swamp forest associations. *Pycnanthemum virginianum* (L.) Durand and Jackson. Mountain mint.
Frequent in bog meadow, E–9. Unreported by Kellerman, but his specimen, 1894, and Werner's, 1893, are extant. Both are labeled *Koellia virginiana* (L.) McM. Flowers, August and early September.
*Scutellaria epilobiifolia* A. Hamilton. UC
Frequent in bog meadow, D–6 and 8. Flowers, July to early August.
*Scutellaria lateriflora* L. Mad-dog skullcap. Kn
Frequent in swamp forest, D–7, E–4, and F–6 and 11. Flowers, August.
*Stachys tenuifolia* Willd. Kv
Found in J–11. Werner's specimen collected in 1893 is labeled *Stachys aspera*. Flowers, late July.
*Teucrium canadense* L. American germander. Kn
Common in hardwood forest, I–10 and J–11. Flowers, July.

## LAURACEAE

*Lindera benzoin* (L.) Blume. Spicebush. Kv
Abundant in swamp forest association and shrub communities. One specimen collected by Spence, 1879. Flowers, April.

## LEGUMINOSAE

*Amphicarpa bracteata* (L.) Fern. var. *bracteata*. Hog peanut
Common in swamp forest and along west path, F–6, 7, and 8, and E–7 and 8. Flowers, August.
*Amphicarpa bracteata* (L.) Fern. var. *comosa* (L.) Fern. Hog peanut. Kv
Common on roadside and in swamp forest, E–8. Kellerman's specimen labeled *Falcata comosa* J. F. Gmel. Flowers, August.
*Apios americana* Medic. Groundnut. Kn
Abundant in swamp forest north of Woodburn Road.
*Cercis canadensis* L. Redbud. Kn
Occasional in swamp forest, F–6.
*Desmodium canadense* (L.) DC. Kn
Occasional in E–9. Flowers, mid-August.
*Desmodium paniculatum* (L.) DC. UB
Frequent along west path, F–4, 6, and 8. Flowers, August.
*Gleditsia triacanthos* L. Honeylocust
One tree is hardwood forest association, J–11.
*Lathyrus palustris* L.
Occasional in shrub communities, F–10 and D–8.
*Medicago lupulina* L. Hop, black medic. UB
Occasional on roadside, E–8. Flowers, late August.
*Meliotus alba* Desr. White sweet clover. UB
Occasional on roadsides, E–8 and 9. Flowers, May.
*Robinia pseudo-acacia* L. Black locust. Kn
Occasional in swamp forest, E–6.
*Phaseolus coccineus* L. UC
Adventive. Growing on fence, north side of Woodburn Road, E–8. Observed only once, in 1970.

*Trifolium pratense* L. Red clover. Kn
Occasional on roadside, F–8. Flowers, August.

## LEMNACEAE

*Lemna minor* L.
Two locations in West Branch, F–4 and 6.

## LENTIBULARIACEAE

*Utricularia cornuta* Michx. Bladderwort. Kv
Frequent in marl meadow, D–6. Werner's specimen, 1893, labeled *U. intermedia* Hayne, has been determined to be *U. cornuta*. Flowers, June to early August.
*Utricularia intermedia* Hayne. Kn
Occasional in marl meadow, D–5 and 6. Kellerman reported this species, but his voucher specimen is determined to be *U. cornuta*. Flowers, May to mid-October.
*Utricularia minor* L.
Rare in marl meadow, D–6. Flowers collected in early May and late July.
*Utricularia vulgaris* L. UB
Collected once in marl meadow, D–6. Flowers, mid-May. Collected by Hicks (undated) at County Line Bog, 1933.

## LILIACEAE

*Allium cernuum* Roth. Nodding wild onion
Abundant in all bog meadow areas and in open areas of arbor vitae stands, D–7 and 8, and E–9. Unreported by Kellerman, but a specimen collected by Werner in 1893 is extant. Flowers, July and August.
*Allium tricoccum* Ait. Wild leek
Abundant in swamp forest, F–6 and 7, and E–8; occasional in deciduous forest, I–10. Flowers, mid-June to early July.
*Clintonia borealis* (Ait.) Raf. Bluebead lily
Planted in Cedar Bog by Mr. Carl Horst in E–9 (C. Horst, personal communication, 1966). Identification doubtful, because plant has not bloomed.
*Lilium michiganense* Farw. Michigan lily
Frequent in swamp forest and along West Branch north of Woodburn Road, F–6, 7, and 8. Flowers, early July.
*Maianthemum canadense* Desf. False lily-of-the-valley, Canada mayflower
Abundant in arbor vitae stands, D–7 and 8, and E–7, 8, and 9. Two specimens at Urbana College. Flowers, May. Relict boreal species.
*Polygonatum commutatum* (Schultes f.) A. Dietr. Large solomon's seal
Observed only one, in F–4. Reported by Hicks, (undated), but no specimen available.
*Polygonatum pubescens* (Willd.) Pursh. Solomon's seal. Kn
Frequent in swamp forest, F–6. Reported by Kellerman as *P. biflorum* (Walt.) Ell. Flowers, June.
*Smilacina racemosa* (L.) Desf. False solomon's seal. Kn
Frequent in swamp forest, F–6 and 7, and G–11. Reported by Kellerman as *Vagnera racemosa* (L.) Morong. Flowers, mid- to late May.
*Smilacina stellata* (L.) Desf. Starry false solomon's seal. Kv
Abundant in arbor vitae stands, E–8 and 9, and F–8. Flowers, early May.
*Smilax rotundifolia* L.
Occasional in deciduous forest, J–11. Identification based on leaf shape and erose irregularly thickened leaf margins. Not seen in flower or fruit.
*Smilax tamnoides* L. var. *hispida* (Muhl.) Fern. Cat's-brier. Kv
Frequent along west path, F–6, 7, and 8, and in swamp forest, E– and F–9. Kellerman's specimen labeled *S. hispida* Muhl.
*Tofieldia glutinosa* (Michx.) Pers. False asphodel
Abundant in bog meadow, D–6 and 7, and E–9. Flowers, July.
*Trillium flexipes* Raf. Nodding trillium. Kn
Abundant in all swamp forest zones. No specimen reported by Kellerman from Cedar Bog, unless possibly this is the specimen he labelled *T. erectum* L. Flowers, late April and early May.
*Trillium grandiflorum* (Michx.) Salisb. Large-flowered trillium. Kn
Abundant in arbor vitae and swamp forest associations. Flowers, May.
*Trillium sessile* L. Toad trillium
Frequent in deciduous forest area, I– and J–11.
*Uvularia grandiflora* Sm. Giant bellwort. UB
Common in swamp forest, F–7 and 8. Flowers, late April and May.
*Zigadenus glaucus* Nutt. White camass. Kv
Abundant in bog meadow zones, D–6 and 7. Werner's specimen, 1893, labeled *Z. elegans* Pursh. Boreal species.

## LYCOPODIACEAE

*Lycopodium lucidulum* Michx. Shining clubmoss
Occasional in arbor vitae stands, F–7, 11, and 12. Unreported by Kellerman, but specimen of this species was collected by W. J. Biddlecombe in 1875. Boreal species.

## LYTHRACEAE

*Lythrum dacotanum* Nieuw. Loosestrife. Kn
(*L. alatum* Pursh. of most authors)
Occasional in bog meadow, D–6. Flowers, late August.
*Lythrum hyssopifolia* L. Gayfeather. UC
Occasional, in D–7. Petals are longer than expected but sepals are shorter than appendages. One specimen at Urbana College. Flowers, late July.

## MAGNOLIACEAE

*Liriodendron tulipifera* L. Tuliptree. Kn
Dominant in tuliptree zones and common in other swamp forest areas.

## MENISPERMACEAE

*Menispermum canadense* L. Moonseed. Kn
Occasional in swamp forest, F–6 and 8.

## MORACEAE

*Morus alba* L. White mulberry. UB
Rare, in deciduous forest, G–12.

## OLEACEAE

*Fraxinus americana* L. var. *americana*. White ash Kn
Common in swamp forest, F–7 and 10, and H–11.
*Fraxinus americana* L. var. *biltmoreana* (Beadle) J. Wright. UB
Observed once, F–9.
*Fraxinus nigra* Marsh. Black ash
Most abundant ash in Bog, in swamp forest, E–8, F–1 through 8, and G– and H–10 and 11.
*Fraxinus pennsylvanica* Marsh var. *pennsylvanica*. Red ash. UC
Observed and collected once in F–9.
*Fraxinus pennsylvanica* Marsh. var. *subintegerrima* (Vahl) Fern. Green ash. UB
The second most common ash in the Bog, found in swamp forest, E–1, 5, and 7; F–7, 9, and 11; and G–10.

## ONAGRACEAE

*Circaea quadrisulcata* (Maxim.) French & Sav. Enchanter's nightshade. Kn
Common in swamp forest, E–6, F–7, and G–11.
*Epilobium coloratum* Biehler. Kv
Occasional in bog meadow, D–6 and 8. Flowers, mid-August.
*Epilobium glandulosum* Lehm. var. *adenocaulon* (Haussk.) Fern.
Rare, on margin of West Branch, F–7. Flowers, late August. Probably a relict boreal species.
*Epilobium leptophyllum* Raf.
One collection from bog meadow, D–6. Flowers, late August.
*Oenothera biennis* L. Evening primrose. Kn
Occasional along roadside and in bog meadow, D–8 and E–9. Flowers, August and September.

## OPHIOGLOSSACEAE

*Botrychium multifidum* J. G. Gmel. UC
In deciduous forest, J–11. Collected and observed only once.
*Botrychium virginianum* (L.) Sw.
Frequent in swamp forest, F–3, 6, and 10.

## ORCHIDACEAE

*Aplectrum hyemale* (Muhl.) Torr. Puttyroot. UB
One colony, in deciduous forest, I–11. Flowers, June.
*Calopogon pulchellus* (Salisb.) R. Br. Grass-pink orchid
Common in marl and bog meadows, D–6 and 7, and E–9. Flowers, mid-June and July.
*Cypripedium calceolus* L. var. *parviflorus* (Salisb.) Fern. Small yellow ladyslipper. Kv
Rare at margin of bog meadow and arbor vitae, D–7 and E–8. Werner's specimen, 1894, labeled *C. hirsutum* Mill. One specimen at Urbana College collected by M. G. Williams. Flowers, late May and June. Boreal species.
*Cypripedium reginae* Walt. Showy ladyslipper. Kv
Frequent in arbor vitae and bog meadow zones, D–6 and 7, and E–5. Flowers, mid- to late June. Boreal species.

*Goodyeara pubescens* (Willd.) R. Br. Rattlesnake plaintain
Rare in two locations in E–9. Flowers, late July. *G. tesselata* Lodd. may also be in this quadrat. One plant planted by Carl Horst (C. Horst, personal communication, 1966), but it has never been observed in flower.
*Habernaria clavellata* (Michx.) Spreng. Green wood orchis. Kv
Common in drier parts of arbor vitae stands, D–7, and E–8 and 9. Flowers, mid-July to early August.
*Habenaria psycodes* (L.) Spreng. Small purple fringed orchid
Occasional in swamp forests, E–8 and 9. Flowers, July. Boreal species.
*Liparis loeselii* (L.) Richards. Bog twayblade
Two colonies in arbor vitae stands, E– and F–9. Kellerman did not report this species, but Werner's specimen, 1893, is labeled *Leptorchis loeselii* (L.) MacM.
*Spiranthes ovalis* Lindl. Small flowered ladies'-tresses. UC
Frequent in swamp forest, E–8 and 9. Flowers, September and October. Southern in range (Braun, 1967).

OSMUNDACEAE

*Osmunda cinnamomea* L. Cinnamon fern. Kv
Common, in F– and G–11 and 12. Three specimens from Cedar Swamp in The Ohio State University Herbarium: Spence, 1877; Biddlecombe, 1878; and Werner, 1893.
*Osmunda regalis* L. Royal fern
One small group of plants in arbor vitae, E–9.

OXALIDACEAE

*Oxalis europaea* Jord. UC
Observed once, in F–7.

PAPAVERACEAE

*Sanguinaria canadenis* L. Bloodroot
Swamp forest, D–7.

PHYRMACEAE

*Phryma leptostachya* L. Lopseed
Common in swamp forest, E–9, F–8 and 9, and J–11.

PHYTOLACCACEAE

*Phytolacca americana* L. Pokeweed. Kn
Occasional in hardwood forest, H–11. Reported by Kellerman as *P. decandra* L.

PINACEAE

*Thuja occidentalis* L. Arbor vitae. Kv
Dominant coniferous evergreen in Cedar Bog. Relict boreal species.

PLANTAGINACEAE

*Plantago lanceolata* L. English plantain. UC
Occasional along roadsides, E–9.
*Plantago rugelii* Dcne. Rugel's plantain. Kv
Occasional in bog meadow, D–6.

PLATANACEAE

*Platanus occidentalis* L. Sycamore. Kn
Common throughout all swamp forest. Largest tree, 44 inches DBH.

POLEMONIACEAE

*Phlox divaricata* L. Blue phlox
Frequent in the hardwood forest, I–11. Flowers, late April and May.
*Phlox maculata* L. Wild sweet william. Kv
Common in bog meadow and along West Branch, D–6, 7, and 8; E–9; and F–8. Flowers, mid-June to mid-July.
*Phlox paniculata* L. Fall phlox. UC
Occasional, E–10 and F–7. Flowers, late August and early September.
*Polemonium reptans* L. Greek valerian. Kn
Frequent in swamp forest, F–9. White-flowered form collected by Dr. Ronald L. Stuckey, #1528, in 1963. Flowers, May.

POLYGONACEAE

*Polygonum hydropiperoides* Michx. Kn
Occasional in swamp forest, D–6 and F–7.
*Polygonum orientale* L. Prince's feather. Kn
Occasional in arbor vitae stand, E–8.
*Polygonum pensylvanicum* L. Kn
Occasional in arbor vitae stand, D–7.

*Polygonum persicaria* L. Kn
Rare. One collection in deciduous forest, J–11.
*Polygonum punctatum* L. Dotted smartweed. Kv
Common in arbor vitae stand and along west path, D–7 and 8, and F–6.
*Polygonum scandens* L. UC
Occasional on fence, in D–8, and in hardwood forest, G–10 and J–10.
*Rumex crispus* L. Curled dock. Kn
In shallow water, H– and I–8.
*Rumex orbiculatus* Gray. Great water dock. UB
Observed only once, in E–9.
*Rumex verticillatus* L. Swamp dock. UB
Occasional, in roadside ditches, D–8 and E–9.
*Tovara virginiana* (L.) Raf. Virginia knotweed. Kn
Common in swamp forest, D–8, E–6, and F–8. Reported by Kellerman as *Polygonum virginianum* L.

POLYPODIACEAE

*Adiantum pedatum* L. Maidenhair fern. Kn
Frequent in swamp forest, E–7, 8, and 9.
*Asplenium platyneuron* Oakes. Ebony spleenwort, UC
Occasional in arbor vitae stand, D–7, and in swamp forest, F–10 and G–11. Specimen collected by M. G. Williams at Urbana College.
*Athyrium pycnocarpon* Tidestrom. Glade fern
One colony in swamp forest, E–7. Fronds frequently 4 feet tall.
*Athyrium thelypteroides* Desv. Silvery glade fern. Kn
Abundant in swamp forest, F– and G–11 and 12.
*Camptosorus rhizophyllus* (L.) Link. Walking fern. Kv
One small colony on a fallen arbor vitae log lying across Cedar Run, D–7, and another on base of tree in G–12. Specimens collected by Spence in 1878 and 1886 and by Werner in 1892.
*Cystopteris* spp.
This is the most abundant fern in Cedar Bog, found throughout the arbor vitae association and in some areas of the swamp forest. There is great variation among the plants in the Bog. Identification of species and hybrids follows Blasdell (1963).
*Cystopteris bulbifera* (L.) Bernh. Bulblet fern. Kv
Abundant in arbor vitae association, E– and F–8, and D– and E–7. Frequent in other arbor vitae stands and occasional in swamp forest, F–9. One collection by Spence before 1880.
Typically, this species has long slender tapered fronds. Stipe only ¼ to ⅓ or less the length of blade. Rachis and rachillae not winged. Indusium usually truncate. Unicellular and multicellular, glandular hairs throughout. Veins end in the sinuses of the margin.
*Cytopteris bulbifera* Hybrids
Seven specimens collected during this study are, I believe, hybrids of *C. bulbifera* with *C. fragilis* (L.) Bernh. Although I have not collected specimens of *C. fragilis* in Cedar Bog, it is found in many wooded areas elsewhere in Champaign County. Almost without exception, the putative hybrids bear bulblets, but morphological characters are different, as noted below.
*Cystopteris* x *laurentiana* (Weath.) Blasdell (*C. bulbifera* x *fragilis*). UC
Specimens #1244 and #1121–B. Overall appearance of *C. fragilis;* tripinnate, pinnae close, most overlapping, especially at base of blade. Indusia with scattered glands and lacerate apex. Bulblets borne on rachis and rachillae. Some specimens glabrous throughout.
*Cystopteris* x *tennesseensis* Shaver. UC
Specimens #1121–A and 1160. Blade deltoid in overall appearance. Stipe half or more the length of the blade. Mostly bipinnate with only few lower pinnae thrice cut. Veins ending in sinuses, rarely in teeth. Bulblets on rachis and rachillae; sometimes covered with hairs.
*Cystopteris bulbifera* x ?
Three specimens do not fit Blasdell's descriptions of hybrids. They are #406–A, 482–A, and 1121–C. Not typical *C. bulbifera*, although most bear bulblets. Veins often end in the teeth, instead of in emarginations. Some blades have no sori or abortive sori. Indusia, when present, are frequently shallowly lobed, not truncate.
*Dryopteris campyloptera* Clarkson (*D. dilatata* Gray). UC
One specimen (#1353) collected in F–10 during this study and three collected in 1962 most nearly resemble this species. Following the death of the elms, the area is sunny and overgrown with stinging nettles and briers, so a search for additional specimens was unsuccessful.
*Dryopteris clintoniana* Dowell. Clinton's wood fern. Kn
Occasional in swamp forest, D–4 and F–9.
*Dryopteris cristata* Gray. Crested fern
Large colonies in D–7, F–6, and G–12. Not reported by Kellerman, but specimens exist collected by Biddlecombe, 1877, and Spence, 1892.

*Dryopteris intermedia* Gray. Evergreen wood fern
Occasional in swamp forest, E–6, and F–10 and 11.
*Dryopteris spinulosa* (O. H. Muell.) Watt. Spinulose wood fern
Common in swamp forest bordering arbor vitae, D–7, E–7 and 8, and F–7 and 11. The most common *Dryopteris* in the swamp.
*Onoclea sensibilis* L. Sensitive fern. Kn
Frequent in E–7 and 8, and in F–5 and 6.
*Polypodium virginianum* L. Rock polypody. UC
One location only—on a downed arbor vitae log along Cedar Run, E–7.
*Polystichum acrostichoides* Schott. Christmas fern. Kn
Only two small plants observed in the Bog, in F–7, west of West Branch, and in I–11. Reported by Kellerman as *Dryopteris acrostichoides* (Michx.) Kuntze.
*Thelypteris palustris* Schott. var. *pubescens* Fern. Marsh fern. Kn
Common in bog meadow, and in arbor vitae stand along Cedar Run, D–7 and 8, and E–7, 8, and 9. Reported by Kellerman as *Dryopteris thelypteris* (L.) Gray.

## PORTULACACEAE

*Claytonia virginica* L. Spring beauty
Occasional in deciduous forest, H–10 and I–11. Flowers, late April.

## PRIMULACEAE

*Dodecatheon meadia* L. Shooting star
One large colony, in E–5. Flowers, mid-May.
*Lysimachia ciliata* L. Loosestrife
Common in swamp forest, D–6 and E–8. Flowers, mid-June through July. Probably relict boreal species.
*Lysimachia quadriflora* Sims. Linear-leaf loosestrife. Kv
Common in bog and marl meadows, D–5 and 7, and E–6. Reported by Kellerman as *Steironema radicans* (Hook.) A. Gray. Flowers, July and August.
*Trientalis borealis* Raf. Starflower. Kv
Frequent in arbor vitae stands, D–7, and E–8 and 9. Three specimens at The Ohio State University from Cedar Bog, collected by Spence, 1892, and by Werner and Wilcox, 1893. Also specimens are present at Urbana College, collected by M. G. Williams. Flowers, mid-May.

## RANUNCULACEAE

*Actaea pachypoda* Ell. White baneberry. Kn
Common in arbor vitae and swamp forest associations, D–7, and F–8, 10, and 11. Flowers, mid-May.
*Anemone quinquefolia* L. Wood anemone. Kv
Frequent in swamp forest association and occasional in hardwood forest. My specimen, #717, and perhaps another, #259, are var. *interior* Fern. Spence collection, 1891, is also var. *interior* Fern.
*Anemone virginiana* L. Thimbleweed
Frequent along Woodburn Road and west path, F–8 and 9. Flowers, July into early August.
*Anemonella thalictroides* (L.) Spach. Rue anemone. UC
Abundant in arbor vitae and swamp forest associations, E–7 and 8, and F–9 and 10. Flowers, mid-April to mid-May.
*Aquilegia canadensis* L. Wild columbine. Kn
Frequent at margins of arbor vitae stands, E–6 and F–7. Flowers, May.
*Caltha palustris* L. Marsh marigold. Kn
Abundant in swamp forest north of Woodburn Road, E– and F–7 and 8; also on the margins of West Branch. Flowers, May. Probably a boreal species.
*Clematis virginiana* L. Virgin's bower. Kv
Occasional at edge of swamp forest, E–5 and 8, and E–9. Flowers, August.
*Hepatica americana* (DC) Ker. Liverleaf.
Abundant in arbor vitae association and at edge of swamp forest, E–6, 7, 8, and 9, and F–7. Flowers, April to early May.
*Hydrastis canadensis* L. Golden seal
Reported by Hicks (undated) as common in Cedar Bog, but collected only once, in F–7. Apparently almost extinct.
*Ranunculus abortivus* L. Kidney-leaf buttercup. Kn
Observed once, in F–9. Flowers, early May.
*Ranunculus recurvatus* Poir.
Occasional in swamp forest, F–8 and 9. Flowers, May.
*Ranunculus repens* L. Creeping buttercup. UC
Frequent in hardwood forest, H– and I–10 and 11, and G–11. Flowers, April.
*Ranunculus septentrionalis* Poir. Swamp buttercup
Frequent in swamp forest, E–7, and F–7 and 10. Flowers, late April to mid-May.

*Thalictrum dasycarpum* Fisch. and Lall. Purple meadow rue. Kn
Frequent in bog meadow, D–6, E–8, and F–11. Flowers, early June.
*Thalictrum diocium* L. Early meadow rue
Occasional in swamp forest, E–7. Flowers, late April.
*Thalictrum polygamum* Muhl. UC
Abundant in swamp forest, F–5, 7, and 11; H–11; and I–11. Flowers, June and early July.
*Thalictrum revolutum* DC. UC
Occasional in swamp forest, F–8 and 9. Specimen #1838. Flowers, June.

RHAMNACEAE

*Rhamnus alnifolia* L'Her. Kv
Common in shrub communities at margin of bog and marl meadows, D–6, and E–5 and 9. Boreal species.
*Rhamnus lanceolata* Pursh. Lance-leaf buckthorn
Frequent in shrub zone surrounding marl meadow areas, E–5 and 6. Reported by Hicks (undated), but no specimen.

ROSACEAE

*Agrimonia gryposepala* Wallr. Agrimony
Frequent in swamp forests, E–7 and 8, and F–6. Flowers, July.
*Agrimonia parviflora* Ait.
Occasional in D–5 and 7, and in F–10. Flowers, late August.
*Agrimonia pubescens* Wallr. UC
Observed twice, at same location, F–7.
*Amelanchier laevis* Wieg. UC
Previously unreported from Champaign County, but at least one specimen labeled *A. canadensis* (L.) Medic, collected by M. G. Williams at Urbana College, appears to be this species. Flowers, late April.
*Crataegus crus-galli* L. Cockspur thorn. Kn
Occasional in deciduous and swamp forests, F–7 and J–11.
*Crataegus punctata* Jacq. Dotted hawthorn. Kn
Collected once in deciduous forest, J–11.
*Filipendula rubra* (Hill) Robins. Queen-of-the-prairie. Kn
Frequent in bog meadow, E– and F–9. Reported by Kellerman as *Ulmaria rubra* Hill. Flowers, July and August.
*Fragaria virginiana* Duchesne. Woodland strawberry
Occasional along west path, F–8. Flowers, early May.
*Geum canadense* Jacq. Avens
Frequent in hardwood and swamp forests, E–7 and 9, H–11, and J–10. Flowers, July to early August.
*Geum vernum* (Raf.) T. & G.
Occasional in F–7. Flowers, mid-May.
*Geum virginianum* L.
Collected once in deciduous forest, I–10. Flowers, July.
*Physocarpus opulifolius* (L.) Maxim. Ninebark. Kv
Abundant in shrub zones along Cedar Run and West Branch, D–5 and 6, F–6 and 7, and E–9. Flowers, mid-June.
*Potentilla fruticosa* L. Shrubby cinquefoil. Kv
Abundant in bog meadow, E–8 and 9. Flowers, June to late September. Relict boreal species.
*Prunus americana* Marsh. Wild plum
Collected once at margin of marl meadow, D–5.
*Prunus serotina* Ehrh. Wild black cherry. Kn
Common in parts of swamp forest, in E–2, 3, 4, and 5, and F–7.
*Pyrus coronaria* L. Wild crabapple. Kn
Observed once, in E–8. Flowers, mid-May.
*Pyrus malus* L. Apple
One tree in secondary swamp forest, F–9. Flowers, late April.
*Pyrus melanocarpa* (Michx.) Willd. Black chokeberry
Frequent in swamp forest, D–7, and F–5 and 9. Unreported by Kellerman, but three specimens collected by him and labeled *Rhamnus cathartica* L. have been correctly identified as *P. melanocarpa*, as is Werner's specimen labeled *Aronia nigra*. Also, specimens occur in Urbana College collection. Flowers, mid- to late May.
*Rosa carolina* L. Kn
Collected once, in D–4. Flowers, early July.
*Rosa carolina* x *palustris*. UC
Two plants appear to be this hybrid, though they may be *R. virginiana* Mill. (see below), specimens #473 from F–8 and #1136 from F–9. Plants larger than *R. carolina;* prickles straight; leaf rachis villous; and flowers, deep pink. Previously unreported from Bog or county. Flowers mid- to late July.

*Rosa palustris* Marsh. Swamp rose. UB
Most common rose in Bog; in swamp forest, D–8, E–9, and F–8 and 10. Flowers, July.
*Rosa setigera* Michx. Prairie rose. Kn
Frequent in drier parts of bog meadow, E–8 and F–9. Flowers, July.
*Rosa virginiana* Mill. UC
Despite Gleason (1952) and Braun (1961), I believe this is the correct designation for my specimens #642 and #988. Both were collected in fruit.
Erlanson (1934) states that the hybrid *R. palustris* x *carolina*, which specimens #642 and #988 resemble, is highly sterile. In *R. palustris*, 2n=14; in *R. carolina*, 2n=28; and in *R. virginiana*, 2n=28 (Erlanson, 1929). My specimens have well-developed apparently normal achenes, which I believe would not be true if they represented hybrids. Specimens #473 and #1136 (reported as hybrids, above under *R. carolina* x *palustris*) were collected from the same quadrats and may also be this species. Unfortunately, the problem was not anticipated and the plants were not marked when in flower. The species was previously unreported in Ohio (Braun, 1961).
*Rubus allegheniensis* Port. Sow-teat blackberry. UC
One large colony in swamp forest, E–5. Fruits, early August.
*Rubus frondosus* Bigel. UC
Observed once, in F–8. Flowers, late May.
*Rubus occidentalis* L. Black raspberry. Kn
Frequent along west path, in F–7 and 8, and also in F–9. Flowers, late May.
*Rubus pensilvanicus* Poir. UC
Occasional along west path, F–5 and 6, and D–8. Fruits, early August.
*Rubus pubescens* Raf. Kn
Abundant as ground cover in arbor vitae stands. In E–6 and 8, and F–6, 7, 9, 10, 11, and 12. Specimen collected by Spence, labeled *R. triflorus* Richards, in 1880. Three specimens collected by Williams at Urbana College. Flowers, late April, early May; fruits, early July. Boreal species.
*Sanguisorba canadensis* L. American burnet. Kv
Common in bog meadows, E–9 and F–10. Flowers, late August.

## RUBIACEAE

*Cephalanthus occidentalis* L. Kn
One colony in H–11. Flowers, mid- to late July.
*Galium aparine* L. Bedstraw. Kn
Common in swamp forest, D–7, E–6 and 7, and G–11.
*Galium asprellum* Michx.
Observed once, in D–8.
*Galium concinnum* T & G. Shining bedstraw. Kn
Occasional in bog meadow, D–8.
*Galium obtusum* Bigel. UB
Occasional in swamp forest, E–6.
*Galium pilosum* Ait. UC
Rare. In F–7.
*Galium trifidum* L. UC
Occasional in swamp forest zone, G–11.
*Galium triflorum* Michx. Sweet-scented bedstraw
Abundant in swamp forest, D–7; E–5, 6, 9, and 10; and I–10 and 11.
*Mitchella repens* L. Partridgeberry. Kv
Common in drier arbor vitae zones, D–7, E–9, and F–10 and 11. Specimens also collected by Spence, 1877 and 1892. Flowers, May.

## RUTACEAE

*Ptelea trifoliata* L. Hop tree, wafer ash. Kn
Occasional in swamp forest, D–8 and F–7. Southeast coastal plain and Mississippi embayment species (Bailey, 1962).
*Xanthoxylum americanum* Mill. Prickly ash. Kn
Occasional in D–8; common in F–6, 7, and 8, H–10 and I–10.

## SALICACEAE

*Populus deltoides* Bart. Cottonwood. Kn
Occasional in F–7. Reported by Kellerman as *P. monilifera* Ait. One large tree 37 inches DBH in F–9.
*Populus deltoides* x *tremuloides*. UC
Specimen #1104 is intermediate between the two species and Dr. Ronald L. Stuckey (personal communication, 1970) has suggested that the specimen represents such a hybrid. The habitat would lend credence to this suggestion, for the plant was observed only once, in I–9, at the margin of the western extension forest and an open field.
*Populus tremuloides* Michx. Quaking aspen
Occasional, in E–10 and F–11.

*Salix discolor* Muhl. Pussy willow. Kv
Common on margins of marl meadow, in shrub zone, D–6.
*Salix glaucophylloides* Fern. Blueleaf willow. UC
Rare, in E–8 and F–11.
*Salix nigra* Marsh. Black willow. Kn
Two large trees joined at the base on west bank of Cedar Run, F–11, measure 19½ and 20½ inches DBH.
*Salix rigida* Muhl. UB
One shrub on north side of Woodburn Road, in E–8.
*Salix sericea* Marsh. UB
Occasional along margins of marl meadow, D–6, and on banks of Cedar Run, E–9, and F–9 and 10.
*Salix* X *subsericea* (Anderss.) Schneid. UB
Rare. East bank of Cedar Run, F–10.

## SARRACINIACEAE

*Sarracenia purpurea* L. Pitcher plant
One plant in D–6. Planted in Cedar Bog, perhaps several times. Evans (1944) states that he set plants in Cedar Bog in two places in 1925. The one plant present today is not vigorous.

## SAXIFRAGACEAE

*Heuchera americana* L.
Frequent in swamp forest, E–4. Flowers, early June.
*Hydrangea arborescens* L. Hydrangea. Kv
Occasional in arbor vitae stand, E–7 and 8. Flowers, early July.
*Mitella diphylla* L. Bishop's cap. Kn
Abundant in arbor vitae stands, E–7, 8, and 9, and F–10 and 11. Flowers, late April to mid-May.
*Mitella nuda* L. Miterwort. Kv
Rare in arbor vitae assocation, E–6 and 7. Specimen at Urbana College collected by M. G. Williams in Cedar Bog is labeled *Mitella nuda cordifolia* Lamark. with a note added, "Very rare, John H. Schaffner." Flowers, mid-May.
*Parnassia glauca* Raf. Grass-of-Parnassus, bog stars. Kv
Common in bog meadow and arbor vitae associations, D–6 and 7, and E–8 and 9. Flowers, late August and September.
*Ribes americanum* Mill. Wild black currant. Kn
Occasional in swamp forest, E–7, F–9, and E–6 and 9. Flowers, June.
*Ribes cynosbati* L. Prickly gooseberry. Kn
Occasional E–8, and F–8 and 9. Flowers, early June.
*Ribes hirtellum* Michx. Smooth gooseberry
Rare in F–7 and 8. Not reported by Kellerman, but Werner specimen labeled *R. oxycanthoides* L. has been identified as *R. hirtellum*. Flowers, June.

## SCROPHULARIACEAE

*Chelone glabra* L. var. *glabra*. Turtlehead. UB
Occasional in bog meadow, D–6 and 8. Flowers, late August and early September.
*Chelone glabra* L. var. *linifolia* Coleman. Kv
Rare, in D–8. Kellerman's specimen is labeled simply *C. glabra* L. Flowers, late August and early September.
*Gerardia purpurea* L.
Frequent in marl meadows, D–6 and E–5. Unreported by Kellerman, but his specimen collected in 1894. Flowers, late August and early September.
*Mimulus ringens* L. Monkey flower. Kn
Rare. In E–9, on margin of Cedar Run. Flowers, mid-August.
*Pedicularis canadensis* L. Lousewort. Kn
Occasional in bog meadow, D–6. Flowers, mid-May. Boreal species.
*Pedicularis lanceolata* Michx. Wood betony. Kv
Common in swamp forest, D–5 and 8, E–9, and F–9. Flowers, late August and early September.
*Scrophularia marilandica* L. Kn
Frequent, in swamp forest, G–11.
*Verbascum thapsus* L. Mullein. Kn
Along roadside, E–9. Flowers, late July.
*Veronica anagallis-aquatica* L. UC
Aquatic, in Cedar Run, E–10, at convergence of streams. Reported by Kellerman, but his specimen, 1894, is not this species, but *V. comosa* Richter, so this species was previously unreported from Champaign County.
*Veronica comosa* Richter. Kv
Common in Cedar Run, in West Branch, and in seepage areas at edge of arbor vitae stand. Flowers, mid-August.

*Veronica scutellata* L. UC
Observed once, in F–11. Flowers, mid-June.

SOLANACEAE

*Physalis longifolia* var. *subglabrata* (Mackenzie & Bush) Cronq.
Occasional, in E–9 and F–9. Unreported by Kellerman, but Werner's specimen, 1893, labeled *P. lanceolata* Michx., has been determined to be this species. Flowers, August.
*Solanum americanum* Mill. UC
Observed once, in F–10.
*Solanum dulcamara* L. Nightshade. Kn
Occasional, in E–6 and 8.
*Solanum nigrum* L. Black nightshade. Kn
Occasional, E–8. This and *S. americanum* may be one species.

SPARGANIACEAE

*Sparganium chlorocarpum* Rydb. Bur reed. UB
In Cedar Run, F–10, at the convergence of the stream. Also abundant in Cedar Run near Mad River. Probably boreal species.

TAXACEAE

*Taxus canadensis* Marsh. Canadian yew. Kv
Common in arbor vitae association, F– and G–11 and 12. Three specimens collected by M. G. Williams are at Urbana College. Relict boreal species.

TILIACEAE

*Tilia americana* L. Basswood, linden. Kv
Common in swamp forest, E–6, 8, and 9, and F–5, 6, 7, and 8.

TYPHACEAE

*Typha latifolia* L. Cattail. Kn
Occasional in roadside ditch, F–8 and along West Branch, F–6.

ULMACEAE

*Celtis occidentalis* L. Hackberry. Kn
Common throughout all areas of swamp forest.
*Ulmus americana* L. American elm. Kn
Once abundant in swamp forests, in F–3 through 10, and G–, H–, and I–10 and 11. No large trees remain, but some smaller ones are still present.
*Ulmus rubra* Muhl. Red or slippery elm. Kn
Common in swamp forests, E–6, F–7 and 8, and G–, H–, and I–10. One large tree in E–2.
*Ulmus thomasi* Sarg. Rock elm. UC
Observed and collected once in hardwood association, G–11.

UMBELLIFERAE

*Angelica atropurpurea* L.
Common along Woodburn Road, F–9. Flowers, late May.
*Chaerophyllum procumbens* (L.) Crantz. Spreading chervil. UB
Occasional in swamp forest, G–11. Flowers, late May.
*Cicuta maculata* L. Spotted water hemlock
Occasional, in E–8 and 9. Flowers, mid-June.
*Cryptotaenia canadensis* (L.) DC. Wild chervil
Common in swamp forest, D–7, and F–5, 7, and 8. Flowers, late May to late June.
*Daucus carota* L. Wild carrot
Occasional along roadside, E–8. Flowers, late July.
*Osmorhiza claytoni* (Michx.) C. B. Clarke
Occasional, in F–8 and 9. Flowers, early June.
*Osmorhiza longistylis* (Torr.) DC. Anise root
Common in swamp forest, F–7, 8, and 9. Flowers, early to mid-May.
*Oxypolis rigidior* (L.) C. & R. Cowbane
Abundant throughout swamp forest, D–7, E–9, and F–9. An extremely variable species. Not reported by Kellerman, but Werner has specimen collected in 1892. Flowers, August to mid-September.
*Pastinaca sativa* L. Wild parsnip. Kn
Occasional along roadside, F–9. Flowers, early July.
*Sanicula canadensis* L. Black snakeroot
Occasional, south side of Woodburn Road, F–9, and along west path, F–7. Flowers, early July.
*Sanicula gregaria* Bickn.
Occasional, in E–8 and F–9. Unreported by Kellerman, but Spence specimen, 1878, is extant. Flowers, early to mid-May. Probably a boreal species.

*Sanicula marilandica* L. Kn
Occasional in swamp forest, F–9.
*Sanicula trifoliata* Bickn. Black snakeroot. UB
Occasional, in F–6 and E–7.
*Thaspium barbinode* (Michx.) Nutt. Kv
Common in swamp forest, E–8, and F–6, 7, 8, and 9. Flowers, late May and early June.
*Thaspium trifoliatum* (L.) Gray. UC
Observed once, in F–9.
*Zizia aurea* (L.) W. D. J. Koch. Golden alexander
Frequent in swamp forest, F–8 and E–8.

## URTICACEAE

*Boehmeria cylindrica* (L.) SW. False nettle. Kn
Frequent, swamp forests, F–4 and 9, and E–8.
*Laportea canadensis* (L.) Wedd. Wood nettle. Kn
Abundant in all open areas of swamp forest.
*Parietaria pensylvanica* Muhl. UB
Collected once, in bog meadow, E–4.
*Pilea pumila* (L.) Gray. Clearweed. Kn
Abundant in arbor vitae stands, D–8, E–9, and F–6 and 9.
*Urtica dioica* L. Stinging nettle
Occurs throughout open swamp forest.
*Urtica procera* Muhl. Kn
Abundant both in swamp forest association and in arbor vitae stands. Possibly reported by Kellerman as *U. gracilis* Ait.

## VALERIANACEAE

*Valeriana ciliata* T. & G. Kv
Frequent in marl meadow, D–5, and E–4 and 5. Reported by Kellerman as *V. edulis* Nutt. Flowers mid-May.
Specimen at Urbana College dated 1839 with a notation by Milo G. Williams, "not known in works of botany." There is no published report of this specimen, although Cedar Bog is the type locality for this species. For a discussion of the history of this interesting species at Cedar Bog, see Stuckey (1966, p. 8–9; 37–38).
*Valerianella intermedia* Dyal. UC
Large patches in E–5 and along Woodburn Road, E–8, and G– and H–8. Flowers, late May and June.

## VERBENACEAE

*Verbena hastata* L. Blue vervain. Kn
Frequent only in bog meadow, D–8. Flowers, late August.
*Verbena urticifolia* L. White vervain
Rare. Collected once, in F–10. Flowers, late July.

## VIOLACEAE

Kellerman did not report a single violet species from Cedar Bog, although one species had been collected by E. Jane Spence in 1877. It is possible that the Spence collection was not obtained by The Ohio State University until later. It seems highly improbable that Werner, who collected in Cedar Bog for two or more years, did not see any violets. The only logical explanation seems to be that this plant family was inadvertently omitted from the published lists. On the other hand, Werner deposited no violet specimens in The Ohio State University Herbarium.
Nomenclature and keys used in identification of the violets follow Russell (1965).
*Viola affinis* Le Conte. Common violet. UC
(*V. papilionacea* Pursh. of most authors)
Frequent, in E–5 and F–7. White-flowered form collected in F–7 is specimen #21. One specimen, #1025, was collected in flower in early October. Flowers, usually late April and May.
*Viola blanda* Willd.
Two colonies on partially decayed logs in arbor vitae association, F–10 and 11. Specimen collected by Spence in 1877. Also a specimen collected by Williams at Urbana College.
*Viola conspersa* Reichenb. American dog violet
Common in arbor vitae and swamp forest associations, D–6, E–4, and F–7 and 9. Flowers, late April and May.
*Viola cucullata* Ait. Marsh blue violet. UB
Common in bog meadow and occasional in swamp forest, D–7, E–6 and 9, and H–10. Flowers, late April and early May.
*Viola macloskeyi* Lloyd ssp. *pallens* (Banks) M. S. Baker. UB
(*V. pallens* (Banks) Brainerd)
Frequent in arbor vitae and swamp forest, E–6 and F–7. Flowers, late April through May. Probably boreal species.

*Viola nephrophylla* Greene. UC
(*V. papilionacea* Pursh., in part)
Most common violet in Cedar Bog. Abundant in arbor vitae and swamp forest associations, D–5 and 7, and F–7 and 8. Distinguished from *V. affinis* by beard on spurred petal. Flowers, late April through May.
*Viola pubescens* Ait. var. *pubescens*. Downy yellow violet. UB
Rare, in swamp forest, F–7. Flowers, late April and early May.
*Viola pubescens* Ait. var. *eriocarpa* (Schwein.) Russell. UB
(*V. pensylvanica* Michx.)
Frequent in swamp forest, E–6 and F–9. Flowers, mid-April to May.
*Viola pubescens* Ait. var. *pubescens* x var. *eriocarpa*. UC
Two specimens, #282–A from F–9 and #1055 from G–11, appear to be this hybrid. The older leaves are glabrous and several basal leaves are present. Flowers, late April and early May.
*Viola rostrata* Pursh. Long-spurred violet. UC
Common in oak-maple segregate, F–4 through 8. Specimens collected do not have as long a spur as might be expected, but still most nearly resemble this species. Flowers, late April and May.
*Viola sororia* Willd. UB
Observed once, in the hardwood forest, I–10. Flowers, late April.
*Viola walteri* House. UC
Frequent in only one location, E–6. Flowers, mid- to late April. Distribution map (Russell, 1965) shows this species to be most common to southeastern United States.

VITACEAE

*Parthenocissus quinquefolia* (L.) Planch. Virginia creeper. Kn
Occasional, in D–7.
*Vitis riparia* Michx. Wild grape
Occasional, in E–9 and F–8. Not reported by Kellerman, but one of his specimens collected in 1894, labeled *V. vulpina* L., has been determined to be this species.
*Vitis vulpina* L. Frost grape. Kv
Occasional, in D–4.

## COMPARISON OF PAST AND PRESENT LISTS OF SPECIES FROM CEDAR BOG

Some species reported by Kellerman (Kellerman and Werner, 1893, and Kellerman and Wilcox, 1895) from Cedar Bog have not been observed or collected during my studies of the past seven years (1963–1970). In addition, there are some species that were not reported by Kellerman, but for which documented evidence exists (mostly in the form of voucher specimens in the herbaria of The Ohio State University or of Urbana College), that were also not found by me. These species are considered to have become extinct during the intervening time, and are given in the two lists that follow.

Of the species listed by Kellerman (Kellerman and Werner, 1893, and Kellerman and Wilcox, 1895) and not found by me, some are questioned and are therefore not included in the list of extinct species. All of these species, which represent 72 taxa in 28 families, have been rejected for one of the following reasons.

1. There is no voucher specimen to substantiate Kellerman's report of the species nor is there in The Ohio State University Herbarium any specimen that has been collected in Cedar Bog either before or since Kellerman's report.
2. Voucher specimens of species reported by Kellerman have been determined to be a species different from that reported.
3. Notation with the specimen shows that the plant was not collected in Cedar Bog.

In addition, 19 families and 25 species that were reported by Kellerman are now listed as "questionable" species. They have either been reported from Champaign County (but not Cedar Bog) since Kellerman's publications, or are cosmpolitan weeds which might be expected in any habitat. None of these have been collected in Cedar Bog, either before or since Kellerman's publications, and none were observed during the time of this study. Mimeographed copies of these two lists are available from the author.

The following list records all species reported by Kellerman (Kellerman and Werner, 1893; Kellerman and Wilcox, 1895) and collected at some time in the past in Cedar Bog, but which were not observed during the present study. Voucher specimens of these species are in The Ohio State University Herbarium.

Two different reasons may account for the lack of collections of these species during the 1963–1970 study.

1. The species reported earlier are indeed extinct in Cedar Bog as a result of environmental changes. No additional collections have been made since the original ones.
2. The species may or may not actually be extinct, but their frequency has been so greatly reduced and have become so rare that observation is difficult or unlikely, as indicated by collections made at least once since 1900, though they were not observed during the present study.

For each of the species listed below, the one of these two reasons that seems best to apply is indicated in parentheses by the number of the reason, as listed above.

CAMPANULACEAE

*Lobelia cardinalis* L. (1)

CARYOPHYLLACEAE

*Arenaria serpyllifolia* L. (2)

COMPOSITAE

*Eclipta alba* (L.) Haussk. (1)

CRUCIFERAE

*Lepidium virginicum* L. (1)

CYPERACEAE

*Carex inflexus* Muhl. (*C. aristatus* Rott.) (1)
*Carex tuckermanii* Dew. (1)
*Carex woodii* Dew. (*C. tetanica woodii* (Dew.) Bailey) (1)
*Scirpus cyperinus* (L.) Kunth. (1)

EUPHORBIACEAE

*Euphorbia humistrata* Engelm (1)

GRAMINEAE

*Echinochloa pungens* (Poir.) Rydb. (1)
*Muhlenbergia schreberi* Gmel. (*M. diffusa* Schreb.) (2)

LABIATAE

*Lycopus virginicus* L. (1)

LEGUMINOSAE

*Trifolium repens* L. (2)

POLYGONACEAE

*Polygonum hydropiper* L. (1)
*Polygonum punctatum* Ell. (1)

PRIMULACEAE

*Samolus parviflorus* Raf. (1)

ROSACEAE

*Amelanchier canadensis* (L.) Medic. (1)
*Geum rivale* L. (1)

SOLANACEAE

*Nicandra physalodes* (L.) Pers. (1)

THYMELAEACEAE

*Dirca palustris* L. (2)

UMBELLIFERAE

*Sium suave* Walt. (1)

Species listed below are those unreported by Kellerman, but for which, with two expections, voucher specimens collected by others are preserved at The Ohio State University or Urbana College. None of these species was observed during this study, nor are any represented by voucher specimens taken from Cedar Bog since deposition of the original ones (at The Ohio State University and at Urbana College). Therefore, these species are also considered to be now extinct in Cedar Bog. In some cases, it is possible that the original collection was made outside the limits of the present Bog, and therefore should not be compared with the 1970 list.

AMARANTHACEAE

*Acnida altissima* Riddell
Specimen collected by Kellerman in 1894.

COMPOSITAE

*Prenanthes crepidinea* Michx.
Specimen collected by Kellerman in 1894.

CYPERACEAE

*Carex leptalea* Wahl.
Collected by Spence in 1877; originally labeled *C. polytrichoides* Muhl. ex Schkuhr. This species is not listed for Ohio by Fernald (1950).
*Carex viridula* Michx.
Three specimens collected by Werner in 1893. One labeled *C. flava* var. *graminis;* two labeled *C. viridula* and also *C. ordin* Ritz. Species collected by Thomas in 1933, from Kennard Bog. Specimen, labeled *C. oederi* Schart., at Urbana College; collected by W. S. Sullivant in 1839.
*Cyperus rivularis* Kunth.
Kellerman's specimen, labeled *C. diandrus* Torr., collected in 1894. Schaffner and Jennings also collected this species from Brush Lake in 1902.

GRAMINAE

*Eragrostis frankii* Steud.
Specimen collected by Werner in 1892.

ORCHIDACEAE

*Cypripedium candidum* Muhl.
Specimen collected by M. G. Williams at Urbana College.
*Medeola virginiana* L.
Werner's specimen collected in 1893; also a specimen at Urbana College labeled *Gyromia virginica* Nutt.
*Pogonia ophioglossoides* (L.) Ker.
Specimen at Urbana College collected by M. G. Williams but not dated. Also specimen collected by Samples at The University of Michigan (Stuckey, 1966).

In summary, 546 taxa are reported from Cedar Bog in the present study (1963–1970). Of these, 225 were reported by Kellerman (Kellerman and Werner, 1893; Kellerman and Wilcox, 1895), 141 were reported by others (based on herbarium specimens), 173 were previously unreported from Cedar Bog, 4 were planted in the Bog, and 3 are unnamed fern hybrids. Twenty-one of the species reported by Kellerman are apparently extinct, as are 9 species reported by others.

ACKNOWLEDGMENTS

The generous assistance of other taxonomists is gratefully acknowledged. Dr. Clara Weishaupt (The Ohio State University) has kindly checked specimens in both the Cyperaceae and the Gramineae; Dr. Ronald Stuckey (The Ohio State University) assisted with several aquatic species.

Dr. T. Richard Fisher (Bowling Green State University) checked the identification of the *Aster* and *Solidago*; both O. A. Alderman and L. C. Chadwick assisted in identifying the oaks.

Appreciation is extended to Mr. John F. Gallagher, of the Clark County Audubon Society, Springfield, for providing several photographs of the Bog. Special thanks, also, are due J. W. Alderman for his assistance in making the vegetation maps and to Dr. Fisher for his direction of the entire study.

This study was partially supported by an American Association of University Women Fellowship.

REFERENCES CITED

**Alexander, W. H.** 1923. A climatological history of Ohio. Eng. Exp. Sta., Ohio State Univ. Bull. 26. 28(5): 175–186.
**Antrim, J.** 1872. The history of Champaign and Logan Counties. Western Ohio Pioneer Assoc., Bellefontaine, Ohio, 407 p.
**Atwater, C.** 1838. A history of the state of Ohio, natural and civil. 2nd ed. Glezen & Shepard, Cincinnati, 460 p.
**Bailey, V. L.** 1962. Revision of the genus *Ptelea* (Rutaceae). Britt. 14(1): 1–15.
**Baird, V. B.** 1942. Wild violets of North America. Univ. Calif. Press, Berkeley. xv+225 p.

**Blasdell, R. F.** 1963. A monographic study of the fern genus *Cystopteris*. Mem. Torrey Bot. Club 21(4): 1–102.
**Brainerd, E.** 1924. Violets of North America. Vermont Agr. Exp. Sta. Bull. 224. 172 p.
**Braun, E. L.** 1928. Glacial and post-glacial plant migrations indicated by relic colonies of southern Ohio. Ecology 9: 284–302.
——— 1961. The woody plants of Ohio. The Ohio State Univ. Press, Columbus, 362 p.
——— 1967. The Monocotyledoneae. The Ohio State Univ. Press, Columbus. 464 p.
**Dachnowski, A.** 1910. A cedar bog in central Ohio. Ohio Nat. 11(1): 193–199.
——— 1912. Peat deposits. Geol. Surv. Ohio, 4th Ser. Bull. 16. viii+424 p.
**Dobbins, R. A.** 1937. Vegetation of the northern "Virginia Military Lands" of Ohio. Unpub. Ph.D. dissert. Ohio State Univ. 161 p.
**Erlanson, E. W.** 1920. Cytological conditions and evidence for hybridity in North American wild roses. Bot. Gaz. 87: 443–506.
——— 1934. Experimental data for revision of the North American wild roses. Bot. Gaz. 96: 197–259.
**(Evans, W. B., Jr.)** 1944. A memorial to Walter Brigham Evans, Jr. Grace May Cowan Tatum, Springfield, Ohio. 54 p.
**Fernald, M. L.** 1950. Gray's manual of botany. The American Book Co., New York. LXIV+1632 p.
**Forsyth, J. L.** 1961. Dating Ohio's glaciers. Ohio Geol. Surv. Infor. Cir. No. 30. 9 p.
**Fowells, H. A.** 1965. Silvics of the forest trees of the United States. Agr. Handb. No. 271. Forest Service, U. S. Dep. Agr. 762 p.
**Franks, R. W.** 1931. Vertebrate fauna of the Dallas Arbor Vitae Bog. Unpub. M.Sc. thesis. Ohio State Univ. 81 p.
**Frederick, C. M.** 1964. Natural history study of the flora of Cedar Swamp. I. The bog meadow. Unpub. M.Sc. thesis. Ohio State Univ. 102 p.
——— 1967. Natural history study of the vascular flora of Cedar Bog, Champaign County, Ohio. Unpub. Ph.D. dissert. Ohio State Univ. 240 p.
**Gleason, H. A.** 1952. The new Britton and Brown illustrated flora of the northeastern United States and adjacent Canada. New York Bot. Garden, New York. Vol. 1, lxxv+482 p.; vol. 2, vi+655 p.; vol. 3, iii+595 p.
**Gleason, H. A.,** and **A. Cronquist.** 1963. Manual of vascular plants of northeastern United States and adjacent Canada. D. Van Nostrand Co., New York. xlix+810 p.
**Goldthwait, R. P.** 1958. Wisconsin age forests in western Ohio. I. Age and glacial events. Ohio J. Sci. 58: 209–219.
——— 1959. Scenes in Ohio during the last ice age. Ohio J. Sci. 59: 193–216.
**Hicks, L.** (undated). A check-list of vascular plants of Cedar Bog, Champaign County, Ohio, which are of interest to student of local flora and ecology. Ohio State Univ. (unpub.). 12 p.
**Howe, H.** 1889. Historical collections of Ohio. Centennial ed. Pub. by author, Columbus, Ohio. Vol. 1. 992 p.
**Kapp, R. O.,** and **A. M. Gooding.** 1964. A radiocarbon-dated pollen profile from Sunbeam Prairie Bog, Darke County, Ohio. Amer. J. Sci. 262: 259–266.
**Kellerman, W. A.,** and **C. E. Werner.** 1893. Catalogue of Ohio plants. Geol. Surv. Ohio Rep. 7(2): 56–406.
**Kellerman, W. A.,** and **E. M. Wilcox.** 1895. First list of plants of Cedar Swamp, Champaign County, Ohio. 3rd Ann. Rep. Ohio State Acad. Sci.: 27–28.
**LaRue, C. D.** 1935. Vegetative reproduction of *Eleocharis rostellata*. Pap. Mich. Acad. 21: 105–117.
**Middleton, E. P.** 1917. History of Champaign County, Ohio, its people, industries and institutions, Vol. 1. B. F. Bowen & Co., Indianapolis. 1161 p.
**Norris, S. E., W. P. Cross, R. P. Goldthwait,** and **E. E. Sanderson.** 1952. The water resources of Clark County, Ohio. Ohio Dept. Nat. Resources, Div. of Water Bull. 22. 82 p.
**Ogden, J. G., III.** 1966. Forest history of Ohio. I. Radiocarbon dates and pollen stratigraphy of Silver Lake, Logan County, Ohio. Ohio J. Sci. 66: 387–400.
**Russell, N. H.** 1965. Violets (*Viola*) of central and eastern United States, an introductory survey. Sida 2(1): 1–113.
**Slife, F. W.,** *et al.* 1960. Weeds of the north central States. Rev. ed. Univ. Ill. Agr. Sta. Circ. 718. 262 p.
**Speer, J. M.** 1958. The genus *Aster* in Ohio. Unpub. M.Sc. thesis. Ohio State Univ. 183 p.
**Stebbins, G. L., Jr.** 1950. Variation and evolution in plants. Columbia Univ. Press, New York. xi+643 p.
**Stuckey, R. L.** 1966. The botanical pursuits of John Samples, pioneer Ohio plant collector (1836–1840). Ohio J. Sci. 66(1): 1–41.
**Tolstead, W. L.** 1942. Vegetation of the northern part of Cherry County, Nebraska. Ecol. Monogr. 12(3): 255–292.
**U.S. Dept. Commerce.** 1964–1969. Climatological Data Ohio. Envir. Sci. Serv. Admin., Weather Bur. 1964–69(13): 183–193; 1965–70(1–13): 1–194; 1966–71(1–13): 1–180; 1967–72(1–13): 1–192; 1968–73(1–13): 1–197; 1969–74(1–13): 1–218.

**Voss, E. G.** 1956. A history of floristics in the Douglas Lake region (Emmet and Cheboygan Counties), Michigan, with an account of rejected records. J. Sci. Labs. Denison Univ. 44: 16–75.

**Wagner, W. H., Jr.** 1963. A biosystematic survey of United States ferns—preliminary abstract. Amer. Fern J. 53(1): 1–16.

**Wagner, W. H., Jr., and K. L. Chen.** 1965. Abortion of spores and sporangia as a tool in the detection of *Dryopteris* hybrids. Am. Fern J. 55(1): 9–29.

**Wagner, W. H., Jr.** and **D. J. Hagenah.** 1962. *Dryopteris* in the Huron Mountain Club area of Michigan. Brittonia 14: 90–100.

**Weishaupt, C. G.** 1960. Vascular plants of Ohio. Harold L. Hedrick, Publ., Columbus, Ohio. 309 p.

**Wherry, E. T.** 1961. The fern guide to northeastern and midland United States and adjacent Canada. Doubleday & Co., Garden City. 318 p.

**Williams, M. G.** 1878. Climatic records for Urbana, Ohio, in Proc. Central Ohio Sci. Assoc. 6(1): 91–103.

**Williams, N. N.** 1957. Pollen analysis of a central Ohio bog located within the prairie peninsula. Unpub. M.Sc. thesis. Ohio State Univ. 17 p.

**Woodson, R. E., Jr.** 1954. The North American species of *Asclepias* L. Ann. Missouri Bot. Garden 41(1): 211 p.